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VETERINARY MEDICINE

FEBRUARY 1943

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No. 2

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No attempts to immunize either solipeds or ruminants against trypanosomes by injection of living or dead trypanosomes or their products has succeeded. Calfhood inoculation, a method fairly successful in inducing a tolerance for various piroplasms has so far failed completely, in the case of trypanosomes.

* * * *

Veterinary literature in India dates back to the *Vedas*, whose origin, according to some authorities, was somewhere about 2100 B. C.; others place the date as far back as 4000 B. C. Particulars of the treatment of worms in cattle and of the manufacture and administration of certain indigenous drugs to animals such as horses, elephants, camels, cows, sheep and goats are described by *Rishis*, or saints.

The earliest official reference to veterinary medicine in India is an army order of 1793, directing that upon the appearance among horses of a disease suspected of being infectious, the affected animals will be removed and the matter reported to the commanding officer of the station, who will order the animals inspected by persons capable of distinguishing disorders of horses. Apparently there were no qualified veterinarians in the Indian army at that time, but in 1799 five graduates of the London Veterinary College were recruited.

Secretary of Agriculture Wickard has ordered producers of spray process dried skim milk to set aside 90% of their output (270,000,000 lbs.) for military and lend-lease.

* * * *

In the last world war the demand was for wheat. In this war meat is the great food weapon. Of the food purchases to date meat accounted for about 40% or 400 million dollars while wheat amounted to only 3 million.

We wouldn't have nearly as many soldiers in England and the Pacific today, if the packing industry hadn't helped find ways of saving shipping.—*Claude R. Wickard.*

* * * *

The University of Pittsburg, in making studies of the changes that take place when beef is subjected to the tenderay process, finds that, in comparison to meats made tender by hanging 30 days, those handled by the newer process show a more rapid rise in two chemical constituents (Sulfhydryl content and soluble nitrogen compounds) which are a measure of protein breakdown. There is also a more rapid rise in hematin-type pigments derived from hemoglobin. At the same time the meat shows less loss of vitamin C by the Tenderay process—a fact of practical importance when beef forms a large part of the diet.

Commissioning of Veterinarians To Be Resumed

The commissioning of such additional veterinarians as may be necessary to meet requirements for the coming year has now been authorized, is announced by R. A. Kelser, Brig. Gen., U. S. Army, Chief of the Veterinary Corps.

Appointments will not be immediately made in numbers sufficient to cover anticipated requirements for the entire year. The commissioning of the additional veterinarians required will be spread over the year to meet needs as they develop. Thus, as applications are received only such number will be commissioned as are required for current needs and those of the immediate future. In making selections, equal consideration will be given recent graduates holding Medical Administrative Corps commissions, those who fail to receive deferment under the Selective Service Act and are inducted as privates, and others meeting the prescribed requirements as to age, citizenship, physical condition, basic and professional training, adaptability for military service, etc.

Information and application forms may be obtained by addressing the Director, Veterinary Division, Surgeon General's Office, Services of Supply, War Department, Washington, D. C.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

★ ★ ★ ★

Technical Medical Training Courses Offered at Nine Centers

In addition to the school for such training at William Beaumont General Hospital, El Paso, Texas, as announced,* there are eight other centers conducting such courses which give technical training for several thousand enlisted men from the nine service commands in the United States, medical replacement training centers, units of the ground forces and air forces. These men are schooled in the technical phases of medicine, dentistry, pharmacy, surgery and veterinary medicine. The eight additional schools are located as follows:

Army Medical Center, Washington, D. C.

Lawson General Hospital, Atlanta, Ga.

Billings General Hospital, Fort Benjamin Harrison, Indiana.

O'Reilly General Hospital, Springfield, Mo.

Fitzsimons General Hospital, Denver.

Army and Navy General Hospital, Hot Springs National Park, Ark.

Brooke General Hospital, Fort Sam Houston, Texas.

Letterman General Hospital, Presidio of San Francisco.

* *Vet. Med.*, 38:1; p. 6.

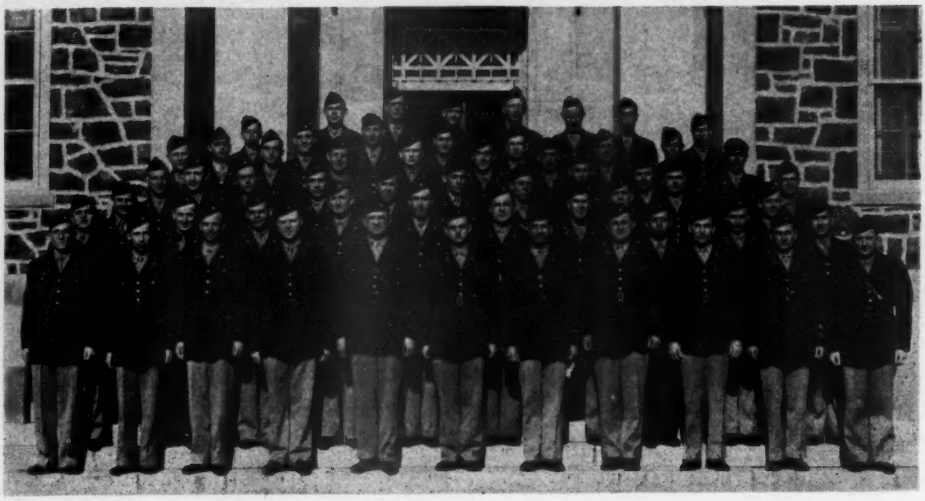
Veterinary Officers of World War I

★ ★ ★ ★

O. C. D. Blood Plasma Used for Burns

A total of 1,308 units of plasma stored in Boston by O. C. D. and U. S. Public Health Service for use in possible enemy action, was used along with Sulfa drugs (usually sulfadiazine), for victims of the night club fire in that city. Plasma is being increasingly recommended for use in burns to overcome shock due to hemo-concentration from loss of plasma into the tissues. This concentration should be calculated so that the proper quantity of plasma may be given to the individual patient.

SIXTEENTH VETERINARY OFFICERS' CLASS MEDICAL FIELD SERVICE SCHOOL



Captains Morris E. Blostein, Ernest F. Chastain, Mark Sterniels, Montgomery A. Tegg, Edward E. Thompson, Neil O. Wilson, and 1st Lieutenants John E. Abbott, Bertram V. Allen, Paul C. Bennett, Israel Berkowitz, Richard D. Beriotti, Theodore W. Brown, Clark W. Burch, Lewis I. Case, Maurice J. Court, James M. Cullison, Donald D. Demke, Charles D. Ebertz, Gardner S. Eversole, Edwin N. Foster, Arthur L. Green, Nelson S. Howe, Samuel Hutt, Alfred Kissileff, Leonard Krawitz, and Burt W. Larsen.

1st Lieutenants Frank J. Linn, Kenneth J. McKenzie, George L. McQueen, Joseph R. Massey, Jr., Robert A. Moody, Edward W. Morehouse, Herman L. Moser, Samuel S. Nebb, Karl W. Niemann, Elton V. Parsons, Charles D. Pickett, Donald J. Presler, William G. Raudabaugh, Robert C. Rea, Paul F. Reichert, Bert Reinow, Glenn W. Rieke, Earl C. Ritter, Robert F. Rochfort, Carl J. Schubert, Carl M. Sepponen, Harold A. Servais, Ervin E. Slatter, Walter H. Steele, Karl L. Sutton, Robert J. Veenstra, William F. Waddell, Peter W. Wassenaar, Alvin R. Wingerter, and Donald A. Wright.

THIS picture was taken in front of Hoff Hall—the new academic building at Carlisle Barracks, constructed in 1941.

Since the beginning of 1941 the Medical Field Service School, Carlisle Barracks, Pa., has given to administrative officers of the medical corps, intensive courses in field duties of two months duration. The number in attendance varies from 250 to 400—from 12 to 57 of them being veterinarians. The instruction is mainly purely military which is the same for all groups of officers. However, parts of the course are strictly specialized and are given only to the officers of a particular professional branch—veterinary, dental or medical.

Carlisle Barracks is one of the oldest military posts in the country. It was established by the British during the French and Indian War, about the middle of the 18th century. In the Revolutionary War, the Continental Army used the post as a supply depot. Hessian prisoners of war built the stone guardhouse which is now in use as a post office for the school. The post was used by the Cavalry in the Civil War, and was the most northern point reached by the Confederate Army at which time it was almost completely destroyed. However, it later became the country's first artillery post.

In 1875 this location became the site of the first non-reservation Indian School—Carlisle.

By order of the Secretary of War in 1920, the Barracks was assigned permanently to the Medical Department of the Army.

As we near the birthday of George Washington during the stress and sacrifices of these war-times we shall do well to give thought to the beginnings of our nation and to the achievements of the man who was "first in war and peace and then first in the hearts of his countrymen." The hardships that he and his followers endured make the puny sacrifices of the home folk in this war seem infinitesimal —insignificant in comparison. The criticism that gas, rubber, fuel-oil and some food rationing has caused must make our fighting men in the tropical jungles, the cruel Arctic and ruthless deserts wonder if we are worthy heritors of the hardy breed that made this a nation! If we can't fight for this nation—and most of us cannot—at least let us gracefully comply, when we are asked to give up a *few* non-essentials for *those* who are doing the *fighting* for us

The Science and the Art of Veterinary Medicine

One of the earliest discoveries that the veterinary graduate makes when he enters the field of practice is that veterinary practice is both a profession and a business, neither one to the exclusion of the other. He finds that his work must be a constant compromise between a profession and a business and here most recent graduates make their first mistake. Unless a practice is conducted on business lines it fails for want of remuneration and a man cannot continue in practice, ethically or otherwise. On the other hand, there are certain fundamentals of his profession that he cannot compromise and still be successful. Where there is an absolute conflict between professional methods and business methods, the professional methods must always prevail or it ceases to be professional at all, and he cannot succeed in veterinary medicine, which, after all, is his profession.

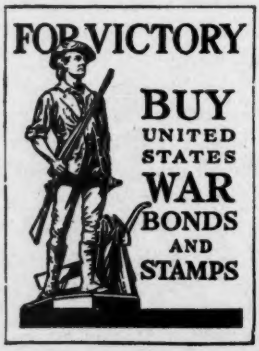
The adjustments are sometimes somewhat delicate and it is not surprising that mistakes occur. Fortunately the professional thing to do is, in the overwhelming majority of cases, the business thing to do also. The business side of practice really supplements and complements the professional phase and makes continuation possible.

* * * *

The pattern of war is exquisitely adjusted to the pattern of infection.—*Plague on Us.*

* * * *

The discipline, the system, the orderliness, the punctuality, the self-subordination and control, the habit of obedience to the leader, and the team-work which come from military training are surely attributes which are of great use in business life. Add to these the health and activity that come from service, and that intangible but nevertheless powerful influence on man's spirit, and you have an equipment that no one can afford to do without, and which can be obtained in no other way. — *Maj. Gen. James G. Harbord.*



Twenty-five Years Progress in Bovine Tuberculosis Eradication*

Tuberculosis in cattle and swine was increasing rapidly in 1917 when efforts were made by interested groups of livestock men, veterinarians and agriculturists (which soon became known as the U. S. Livestock Sanitary Association) to secure legislation which would be of material assistance in a project deemed necessary to eradicate this disease from the livestock, particularly cattle, of the United States. At this time there had

Generalized tuberculosis

been an increase of tuberculosis in cattle during the preceding 10 years from .9% in 1907 to 2.1% in 1917 and in the same period that in swine had increased from 2 to 9.8%.

After the Congress and the President had been convinced that tuberculosis in live stock was not merely a problem of the farmers but a serious Public Health Menace, appropriations were made for eradication of this disease from cattle. This sum included funds for partial reimbursement to farmers for loss resultant from condemnation after tuberculin tests. Appropriations at first were made sparingly, but reached $6,361,040 by 1930 (state and county appropriations brought it up to $18,000,000 for that year).

So thorough a job was done by Federal, State and local veterinarians in tuberculin testing all breeding and dairy cattle that in 1942, just 25 years after the project was started, there were only 1,593 (.013% of total slaughter) cattle condemned under Federal inspection as compared with 40,746 (.43%) in 1917. Hog losses from tuberculosis have decreased somewhat during the same quarter century (from 9.89 to 7.96%) but not to such an extent as that of cattle. A greater reduction in swine tuberculosis is dependent largely upon the elimination of the disease from poultry. Government records show that in those states where the least has been done to eliminate tuberculosis from poultry, there is a higher percentage of the disease in hogs. Eradication of avian tuberculosis would rebound to the benefit of both the swine and poultry industries, not only in healthier stock, but in poultry an increased egg production which is so essential in the war emergency.

* Excerpts from paper of H. R. Smith, Manager, *National Live Stock Loss Prevention Board*, presented to *U. S. Live Stock Sanitary Association*, 1942.

Foodstuffs to Allied Nations

Dried egg deliveries to Allied destination has increased steadily—in October they amounted to nearly 15 million pounds, the equivalent to 44 million dozens of eggs in the shell which is about 15% of the total American production. The shipping of all foodstuffs for Allied Nations in October was 93 million pounds over that of the preceding month—a total of 645 million pounds for that one month alone. The October total of meats for the Allies was more than 93 million pounds.

Sulfa Drug Film*

The department of surgery, John Hopkins University, has developed a new surgical dressing for burns and wounds. It is a film, which looks somewhat like rough waxed paper, but which has a 30 to 50% content of sulfadiazine. In most cases where this film has been used, both for burns and for wounds, bacteriological examination has shown that there was no evidence of infection.

When used on burns, if there is gross contamination, the surface and surrounding skin is cleaned with a surgical detergent, then washed with salt, sulfadiazine or azochloramid solution. The film is put on while the surface is still wet and a firm gauze dressing applied.

Several of the larger commercial houses are beginning to manufacture the films.

* Directions for making this film may be found in *Science Supplement*, 96:2501; p. 12.

Avian Pneumo-encephalitis

Newly Identified Virus Infecting Poultry

By J. R. BEACH
University of California
Berkeley

A newly identified virus which causes Avian Pneumo-encephalitis in poultry is not related to the Western Equine encephalomyelitis or St. Louis type.

In hens affected with the disease production of eggs practically ceases and has not returned after several months. Recovered chicks may be virus carriers. The mortality of the disease ranges from a negative number to 21%. It is widely distributed.

A partial summary of the results of the author's investigations in the identifying of the virus follows:

1. Avian Pneumo-encephalitis is proposed as a suitable name for a newly identified virus disease of poultry in which both the respiratory tract and the central nervous system are involved and which has previously been termed a respiratory nervous disorder. It has been shown to be distinct from other known virus infections of poultry in the United States. Outbreaks of the disease have occurred in both young and adult chickens and in turkeys.

2. The virus has been shown to be present in the lungs, spleen, brain, blood and tracheal exudate, especially those in the early stages of severe infection. It has also been demonstrated in intestinal contents and feces.

3. The virus in lung tissue, dried over phosphorous pentoxide while frozen, and then refrigerated for 195 days, produced the disease. Preserved in 50% glycerine, its virulence was reduced, but not destroyed, in 85 days. When stored in a dry-ice refrigerator, it retained full activity for seven months—the longest period tested.

4. It has been shown that the sera of chicks that have recovered from either natural or artificial infection will neutralize the virus. By cross-immunity tests, strains of virus from many sources (some separated as much as 500 miles) were found immunologically identical.

5. The virus was readily cultivated in chick embryos inoculated either by depositing the inoculum on the chorio-allantoic membrane or by injecting it through the air cell. The former method of inoculation, however, is considered preferable.

6. The infection has been transmitted to healthy chicks by contact exposure to diseased ones and by injection of infected tissues. Nearly all methods of inoculation are effective in transmitting the disease but intramuscular has been the most consistent means of artificial transmission. Notwithstanding the wide distribution of the virus in the tissues of infected chicks and the variety of routes by which transmission has been accomplished, the inoculation with material from field cases has given irregular results.

7. Virus has been demonstrated in the lungs of chicks two to three months after they had recovered from natural infection.

8. Encouraging results have been obtained in preliminary experiments in the immunization of young chicks with formalized suspensions of infected chick embryo.

* Excerpts from paper presented to *U. S. Live Stock Sanitary Association*, 1942.

* * * *

More Meat Being Federally Inspected

The statement that federally inspected meat will shortly rise above 75% as compared with approximately 66% as of recent time, was made by O. W. Seher of the B. A. I. at the 1942 meeting of the U. S. Live Stock Sanitary Association. This has been brought about by the new federal meat regulations (June 10, 1942) which authorized the extension of this inspection to establishments doing intrastate business. These new rules were made to give these concerns an opportunity to sell their products for the armed forces and lend-lease shipment.

Dog Food Committee Blunders Again

Certainly from its record one should have expected it, nevertheless, it must have been a surprise to many members of the A.V.M.A. to receive from the dog food committee of the Association, a mimeographed circular urging the use of "fats, drippings, vegetable oils" in home-made dog foods. As everyone knows, the Government has stated that all fats that can possibly be salvaged are needed in the manufacture of explosives. Millions of housewives are patriotically saving all their kitchen fats for this purpose as a contribution to the war effort. Meat markets and rendering plants are under compulsion to route all such material to the manufacture of explosives. Yet the dog food committee picks this, of all times, to counsel what would amount to a sabotage of this program.

Nor is that all, even the dog food committee must know that there is at present an acute shortage of animal proteins to supplement farm and commercial rations for poultry and swine. Not one feed manufacturer in ten has been able to procure an adequate supply of animal proteins during recent months and the problem of supplying these essential food elements for the increased production of pork, poultry, and eggs, for which the Food Administrator has asked, is as yet unsolved. In the face of these hard facts, the dog food committee urges the use of fish by-products, sour milk whey, buttermilk, cottage cheese and cooked tripe among other things in the concoction of home-made feeds for dogs.

The committee has done dog owners and dogs a distinct disservice in advertising this matter. But the chief victims of this *mal-adroit* advice will be veterinarians. Inevitably, if, as the circular suggests, veterinarians promulgate these views in radio broadcasts and newspaper interviews, it will result in the charge by some vociferous contributors to the *vox populi* section of newspapers that veterinarians are more interested in the maintenance of dogs for their practices than they are in the production of explosives for our armed forces or a maximum supply of food for our fighting Allies. Of course, the committee does not mean this, but unfortunately it has implied it, and laid the profession wide open to the charge, by its worm's-eye view of the situation.

In any case, there was no occasion for this outburst of the committee. There is as yet no dearth of excellent commercial dog foods, both dry and dehydrated, which are manufactured with the consent of the authorities and thus cannot be said to be in contravention of the war effort. There is as yet no foreseeable time when the family that cares for and is able to support a dog cannot feed it at no expense to the war effort.

In passing it may be mentioned that the dog food committee has a new name—"Joint Committee on Foods." But this circular shows that it is the same old committee and still possesses the unique distinction of being able to put both feet in its mouth every time it opens it.

Dog and Man Long Associated

Archeological records show that the dog was closely associated with man in very ancient times. Bones of both have been found side by side in cave habitations as far back as the Stone Age. Early carvings show pictures of what seem to be hunting scenes; men, dogs, horses. At any rate, aside from such inaccessible spots as the West Indies, New Zealand, and a few other islands, primitive pictures and remains show that dogs existed wherever man lived thousands of years ago. . . The Egyptians, probably, were the first people to bring the dog to anything like its present physical state. They not only used the dog in the chase, but also considered it divine, as indicated by friezes and other decorations on their temples. As early as 4000 B.C. they had domesticated the dog, and it was customary to bury him along with his master, or at least in a cemetery containing human remains.—*Amer. Ken. Gaz.*

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Effects upon Domestic Animals of Air Raids in England

By ERIC HARDY, F.Z.S.
Liverpool, England

AMERICAN animal experts are now probably in the same position in which we found ourselves when the first air raid sirens sounded so long ago as the almost forgotten autumn of 1939. We were prepared. We had booklets issued by the Government and the Royal Society for the Prevention of Cruelty to Animals based upon information gathered from the British and French Army Veterinary services in the last war, and based upon sound ideas for treating animals after gas, bomb and other injuries. Three years later we are even better prepared because in the experience of blitz after blitz we have unlearned a lot of the stuff we learned in those fateful September days: problems about animal casualties of which we never dreamed have arisen and been dealt with successfully. The whole of the Air Raid Precautions for Animals has been revised and re-organized. A fault that still exists is we now have no one central National A.R.P. for Animals Committee including representatives of the veterinary associations, the animal welfare societies, dogs' homes, horse shelters, animal clinics and the Government, because they could not agree upon financial matters. The numerous independent organizations that split to work on their own, will, however, do the job effectively, and their experience and methods should be of considerable value to American veterinarians.

The most important discovery made has been that far fewer animal casualties occur in a raid than was originally expected, and although there are usually sufficient qualified veterinarians to meet the demand after a big blitz however, in case of need, this number is readily augmented by "Animal Wardens" which have been trained in animal first-aid and who can be stationed at first aid posts in each district. It is also advisable to have "Animal Guards" in the various streets to bring animal casualties to these wardens so that only the more serious cases go to the veterinarians. There is also a system of mobile veterinary clinics to rush extra help from various centers into the concentrated area of the blitz. The greatest problem is that of the stray, homeless dogs and other animals after the blitz. They cannot just be rounded up and housed at dogs' homes and other centers owing to the risk of starting epizootics. A number of street detention posts are therefore used.

The animal casualty statistics in Britain up to the summer of 1942 were, so far as they were officially recorded:

	Total Casualties	Killed Outright	Received Treatment	Saved	Destroyed
Horses:	780	216	282	45	237
Cattle:	2,132	524	520	724	364
Sheep:	1,377	757	57	297	266
Pigs:	750	216	25	393	116
Total:	5,032	1713	884	1,459	983

London reported 102,600; Birmingham 6,100; Manchester 4,600; Coventry 2,400; Liverpool 2,400; Plymouth 2,100, and Swansea 1,100 bombed-out stray animals. These figures, issued by the present NARPAC (National A.R.P. for Animals Committee), which doesn't include even the larger part of all the animal welfare and veterinary bodies, are only the cases reported. Since it is not compulsory to report animal casualties in raids, the true figures are no doubt considerably higher than these.

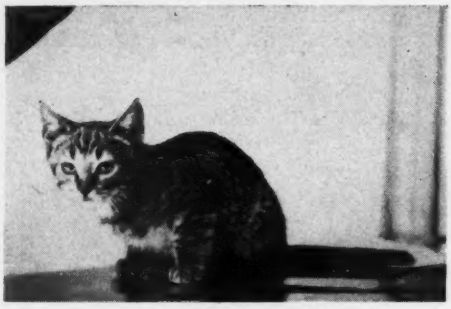
In the early days of the raids on London, vast numbers of dogs and cats were rendered homeless in the Silvertown area, which in a few days became dangerous to humans because of starving packs of dogs that took possession of evacuated houses. Excepting for cats which are left behind to keep down the rats and mice in the blitzed buildings, the homeless, wandering animals are now rounded up after each raid and sent to detention posts until their owners are traced, otherwise they are destroyed.

Animals were found to suffer considerably from blast, just as do human beings. Many animals have died from shock. I had charge

of an animal first-aid post in one of our most often raided cities. When houses came down, the domestic cat or dog had generally gone down to the basement or cellar because of its fear of the noise and often was not discovered until three to five days later. They showed all the trembling and shivering symptoms of humans suffering from bomb shock and required the same warmth and stimulation. When the war began we were given bromide sedative tablets to give to dogs and other animals when a raid began so that the crashing of bombs and banging of anti-aircraft guns would not alarm them. I never used any of mine. When people came to me and said that their dogs "went off their heads" whenever the raids began, I advised these people to take sedative tablets. Gradually they understood. The dogs responded exactly like their owners. If, as soon as the sirens wailed out their warning, the family became excited and went rushing about the place and then bolting into the

Raids in the early days of the war left great numbers of dogs homeless. These starving packs took possession of evacuated houses and became a menace to the community.

air raid shelter, there to sit with their nerves keyed up, ready to jump at every explosion, the dogs ran wildly about the place barking and jumping and it was almost impossible to get them into the shelters. If the family behaved quietly the dogs paid little attention to the blitz. My own collie always barks when the sirens start or even when an enemy plane comes droning overhead before the sirens, because he knows it is a danger signal. But in the air raid shelter he merely trots to his corner and goes to sleep without showing any concern for the commotion outside—not even



Stray cats secrete themselves in blitzed buildings in ungetatable places

on the occasion when a parachute mine blitzed our house. When a heavy high explosive crumped into the ground near enough to send some big earth tremors, he started up from his sleep, as if wakened, but soon lay down again.

With farm stock, we found that our original ideas of collecting horses and cattle into stables whose walls were reinforced with sandbags and earth boxes and windows made gas-proof with damp sacks and blankets, was not practicable. It was much safer to leave the animals grazing in the field. They took no notice of the air raids unless they experienced an "incident." Because they lacked our knowledge of the painful consequences of the sirens, bombs and gunfire they knew no fear. Often bombs dropped in open fields without killing any of the stock for the loose earth absorbs a lot more of the blast than does the hard surface of a city street. But once an animal was hit by a shrapnel or bomb splinter, it always afterward became alarmed at the sirens or gunfire, for it associated its pain with the raids. When a bomb fell on a stable in which animals were collected it killed a large number that would have been saved if they had been left in the fields.

As can well be imagined, veterinarians have no easy task working with a masked hurricane lamp in a stable or in an open field during blackout conditions in the mid-

dle of a winter night raid, unable to shine a torch or show a light, with two or three hours to go before the raid stops. But the work has been done. Originally it was planned that most of the farm stock killed by bombs could be used for human food, but it was found by experience that very little can be salvaged for the meat market. In rural districts animals and human populations are widely scattered and often it is some time after a bomb has fallen that animal casualties are discovered, and often it is not known when the animal was killed. Usually it is not until next day, or even later, that a butcher can be brought out to dress the carcass. By that time the meat is unfit for human consumption. The big raids take place at night after the animals have had their main meal and their intestines are full of half-digested food which rapidly decomposes and taints the flesh. At the packing houses, animals are starved the day before slaughter to avoid this contamination. The remedy for this is to train a man on each farm in the elementary butchery or slaughter-house work to make the animal clean after it has been killed.

In the streets, all cart horses are required by law to wear a second emergency webbing halter and short cord lead. Originally when sirens sounded, the carters braked their carts and tied the horse by this halter to the back wheel, so that it could not bolt from fear during the raid. This is not now generally practiced, as men find they can keep their horses under control and get them safely off the streets to stable or field with less effort and comparatively more safety. Stray cats are a problem in blitzed buildings because they secrete themselves in difficult ungetatable corners, and are most dangerous to the public. A cat-grasper has been devised to bring them

Carters now keep their horses under control and get them off the street to a field or stable, rather than brake their carts and tie the animal to the back wheel until "all clear" is sounded

out of such places. It consists of a long hollow cane, or bamboo pole, with a cord passing through it and a running noose at the far end. The noose is worked over the cat's head with the aid of the pole, the string is then pulled to draw the cat up to the end of the pole. If possible it is pulled out and treated if necessary but if this cannot be done the cat is held in position and under control, unable to move, while it is humanely killed.

Practical experience has shown that, while detention posts for stray animals have many uses, the answer to the problem of care of stray animals immediately after raids, is to be found in the organization of a chain of Refuge Homes in the residences of house-

Early in the war it was expected that farm-stock killed in air raids could be made available for human food but up to the present this has proved impracticable

holders prepared to accept one animal, or at the most two, for periods up to three days. Such people with their addresses are listed beforehand at the local NARPAC post or animal clinic. Eight thousand animals have thus been rescued, eight being treated, 3,392 returned to their owners and 4,600 destroyed since their owners were unknown. The number of actual casualties after an air raid has seldom been more than local veterinarians could handle without assistance, but to save them trouble with minor cases of small animals, first-aid posts were established at the homes of animal guards. These first-aid posts are provided with a NARPAC first-aid box for small animals. These standard small animal boxes contain: A 10-oz. bottle of antiseptic, an 8-oz. bottle of disinfectant for cleansing wounds, a 6-oz. bottle of boracic acid eye lotion, a 3-oz. tin of zinc oxide ointment, a 4-oz. jar of tannic acid jelly (2 percent) for burns, a bottle of 25 (5-gr.) sedative tablets for dogs with hysteria or panic (more useful when given to dog owners who show these symptoms!), a 5-yard spool each of one-inch and two-inch adhesive tape; a dozen safety pins, four wooden splints (12 by 1½ inches, 9 by 1 inches, 6 by ¾ inch and 4 by 1 inch), a dozen each of bandages 6-yards long by 4 inches wide and 6-yards by 2 inches, a 4-oz. roll of cotton wool, one dozen 6-inch gauze tissue squares for placing over wounds before dressing, and a hank of 1 inch linen tape. If there is anything else I would recommend for similar "first-aid for animal" boxes in America, it would be a humane killer and its cartridges, for use in case one has to despatch a horse or beast suffering from ultimately fatal injuries. It is important, however, that animal first-aid posts must act in co-operation with air raid wardens, fire-watchers, police and others on duty during air raids: they cannot rely upon animal guards who may be unable to find all or even any of the animal casualties. The post must be officially recognized and known at the local air raid warden's sector post.

Nearly 1,000 veterinarians are in charge of 6,000 first-aid for animals mobile units—speed is just as essential in dealing with injuries to valuable farm stock and horses, as with humans. Apart from salvage, when the Ministry of Food pays the market price for farm animal carcasses still fit for human consumption, Britain pays no actual compensation to owners of animals that are killed in air-raids, until after the war. Domestic pets are not allowed in public air-raid shelters, for obvious reasons, but some owners, chiefly women, have caused scenes over this point. Horses stabled in towns often have to be rescued from burning stables and the risk of stampeding is avoided by throwing sacks, slit down one side, over the animals' heads before they are lead out of the burning building.

Summing up the three years of war upon which we can base our plans for preparation for the second front and the future raids, we can say that the real effect of heavy raids upon towns is not to produce a staggering list of animal casualties and deaths, but an embarrassing number of stray animals with homes destroyed, which are wandering about the place without collars or other means of identification, and the owners of many of which may not be traced because they have been killed. At the famous London Zoo in Regents Park, and its country establishment at Whipsnade Park, Bedfordshire, there have been only eleven "incidents" during air-raids (eight at the London Zoo and three at the Whipsnade Zoo). During these there were 55 high explosives, two oil bombs and 200 incendiary bombs which hit the Zoo, and although considerable material damage was done to buildings, very few animals and no attendants were seriously injured. In many towns, however, the veterinarians have seen their livelihood taken away because the place has been so blitzed that there are far fewer animal owners living than is necessary to provide them with employment. At the beginning of the war many thousands of valuable dogs and other animals were killed by their owners who were anxious to save their pets the agony of raid damage, but there was never any need for this and we hear nothing now of the 1939 advice to evacuate all dogs and pets from the towns to the country.

Attacking the Bovine Mastitis Problem

By CHARLES W. GATES
South Burlington, Vermont

BOVINE mastitis is the most serious problem confronting both the dairy industry and the veterinary profession. This costly disease has been increasing in prevalence for a number of years and, at least, during the past 15 years, over which my experience in dairy practice extends, the increase has been rapid. The present enormously augmented demand for dairy products has brought it to the forefront and has made it the problem of first importance in animal disease control.

Notwithstanding the incalculable loss this disease occasions to that most important branch of agriculture, the dairy industry, and the necessity for a greatly enlarged production of food for our ever-growing armed forces and for lend-lease, neither the federal nor any state government has any plan, project or program for the control of mastitis in our hundreds of thousands of infected dairy herds. The veterinary practitioner must handle this problem, at least for the present. But the case is not hopeless, for he can do it. Anyhow he can do the preliminary work just as he did in the matter of bovine tuberculosis control and, to a lesser extent, in bovine brucellosis control.

It will be remembered, by those familiar with veterinary practice during the first two decades of the century, that a large amount of tuberculin testing was done by practitioners in the ordinary course of practice and not a little educational work was carried on by many of them. They did the spade work upon which the confidence of cattle owners was founded and much of the educational work that brought about the cooperation of these owners. In time, and it took a score of years, this created the demand for and made possible the success of the government project, which has achieved so brilliantly for the past 25 years.

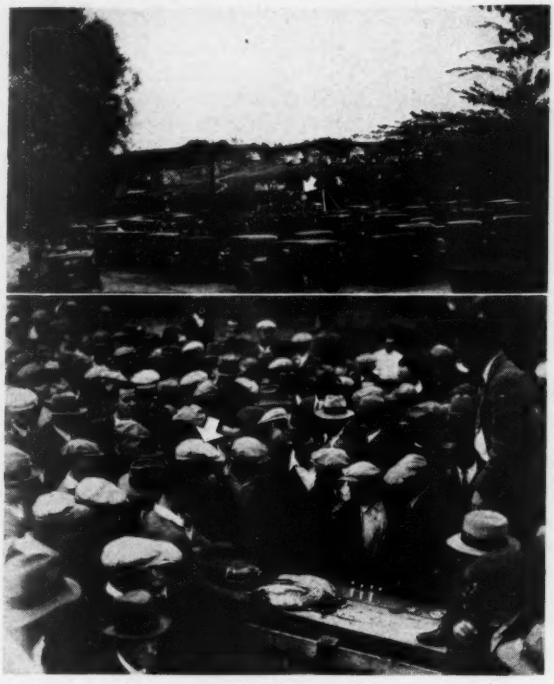
The mastitis problem lends itself to some of the same methods of attack that were successful against tuberculosis. The cattle owner must first be impressed with what the disease is costing him. This loss is more obvious than was the case with tuberculosis, but it is by no means fully appreciated. Then he must be shown that his veterinarian can stop the spread of the disease, can bring many of his affected cows back into full production and, with his cooperation, can eradicate mastitis from his herd. Many of us remember that some 30 years ago, it was common for the veterinarian to take the owner of the cows that had reacted to the tuberculin test and a number of his neighbors to the packing house to see the animals slaughtered. Other veterinarians had the reactors slaughtered on the premises with neighbors for miles around in attendance. This was a convincing way to show them that they did not want tuberculosis in their herds. Mastitis lends itself to similar educational methods. The demonstrations, however, are less spectacular but more persons are interested—the attendance is greater. The accompanying illustrations show one such demonstration. There is nothing unethical about it. It is educating through seeing, and it is effective. We are trying to knock out an enemy that is stealing food we need for the war effort.

In undertaking the control of mastitis in a herd the practitioner's problem is more difficult than it was with tuberculosis. He must use special methods of diagnosis more complex than the tuberculin test; perhaps he may have to make some preparation and he needs special equipment and, equally important, he needs to streamline his mastitis control work so that he can do much of it at a nominal cost to the dairyman and yet at a profit to himself. This too he can do, as I shall show.

In 1928 I was transferred from the Bureau of Animal Industry, U. S. Department of Agriculture, to the Food and Drug Administration, and was assigned to the enforcement of the Federal Import Milk Act of 1927. The law had for its purpose the regu-

lation of the importation of milk and cream from Canada into the United States. It set forth certain definite bacteriological standards and also provided that milk and cream imported must be from cattle free from disease. In 1928 there were approximately 10,000 Canadian herds comprising 150,000 cattle producing milk and cream that was being shipped into the United States daily, for human consumption.

The duties of the new assignment required the physical examination of these cattle, and the collection of milk samples for bacteriological examination. Here was found a vast network of infectious mastitis. Herd after herd was examined physically; the suspected cows isolated and milk samples taken at regular intervals for bacteriological examination. In the course of these tests, it was soon apparent that streptococcic infection prevailed in many of these Canadian herds to the extent of from 1 to 40%. The provisions of the Federal Import Milk Act would not permit the importation of milk and cream from such herds, therefore it became necessary to formulate some practical method of disease control. This was done by a careful physical examination and the collection of composite of milk from each lactating cow in the entire herd. These samples were examined microscopically (Breed Method), incubated for 48 hours and then bacteriological examinations were made to determine what percentage of the herd was infected. By following this procedure week after week over a period of about three years, in the enforcement of the law, an opportunity was afforded to gather a lot of information on infectious mastitis such as: what frequent bacteriological examinations of both milk samples from individual cows and composite milk samples from each lactating cow in the herd would show, as well as what a careful physical examination, from time to time over a period of many months, would reveal. This procedure offered an unusual opportunity for study of the spread of infection from cow to cow and also from one quarter of the udder to another, under ordinary farm conditions such as the veterinarian will encounter from day to day in dairy practice. Then, too, it afforded an excellent chance to observe the behavior of streptococci in the udder in the matter of tissue destruction, as shown by the range of the cell count from one examination to another and also to detect the effect of this destruction upon the quality and quantity of milk from the infected quarter. To determine this, quarter samples were collected and tests for butterfat were made. The results showed a wide variation in fat content in cows with one or more infected quarters, ranging from 0.1 to 5.3% butterfat in the different quarters of the same udder. This



Dr. C. W. Gates (arrows) giving a public demonstration of the effect of mastitis on the udder

is evidence that the fat secreting portion of the udder is the first to be destroyed by the invading bacteria.

Among 10,000 Canadian herds under supervision during the years 1928-1930 it was found that 4.3% of all cattle whose milk was examined microscopically showed streptococcic mastitis in one or more quarters. This, of course, meant a tremendous loss in milk production. It is estimated that there are 24 million dairy cows in the United States and that the average cow produces 4,600 pounds of milk annually. Assuming the same degree of infection as existed in Canadian herds 15 years ago, it would represent an annual loss to the dairy industry of this country of $48,554,955 when the price of milk is $1.50 per hundred pounds—far more at present prices.

The chart showing the examination of a herd of 43 dairy cattle is illustrative of a convenient routine for the use of veterinarians who have a dairy practice, and who are face to face with the perplexing problem of mastitis control. There is no avenue of escape for the dairy practitioner at this time of rapidly spreading infection from cow to cow and herd to herd. Since there are no official programs by the states or the Federal Government, veterinarians must hold this disease in check for the present at least. To accomplish this every effort must be made to equip themselves with the most exact methods for the detection and treatment of infectious mastitis. During the past few years several tests have been offered for the diagnosis of this disease. These tests have been used by creamerymen, dairy inspectors and dairymen with varying degrees of success, but without fundamental knowledge of their true merits. The writer checked these tests in hundreds of milk samples against the microscopic test and, in comparing the results, is convinced that for accuracy and dependability there is only one way to a correct diagnosis of infectious mastitis for the professional man and that is by the microscopic examination of milk samples.

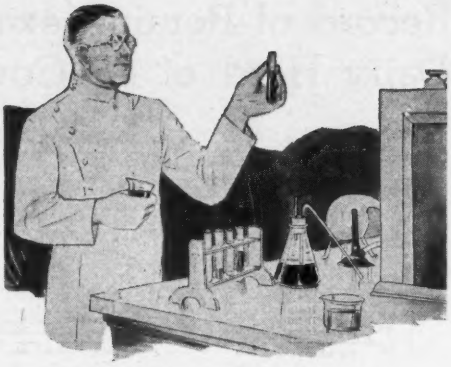
In daily practice a supply of sterile, sample bottles is carried along with my other equipment and whenever a dairyman has a cow that has been showing some garget in the milk samples of her milk are collected from each quarter of the udder. After microscopic examination, a report is made

Use of the microscope in testing milk is strongly urged by the author

out and mailed to the owner or if the examination reveals a condition that requires immediate attention, he is advised by telephone of the findings. This usually results in a call to treat the animal as soon as possible. It is also of great value to the owner in protecting the remainder of the herd from undue exposure. In all herds under my care, semiannual examinations of milk samples are made from each cow in the milking line and a complete chart is prepared for the owner which shows the findings of each composite sample. For this service a charge of 50 cents is made for each sample examined. If the dairyman has 100 head of cattle this nets $100.00 a year for this service alone. Ten or a dozen such herds isn't so bad in addition to one's daily practice. It is easy to collect and examine (microscopically) 50 samples each day in addition to my other practice. Of course, this cannot be done by keeping banking hours, but often requires night work to complete. At present a good portion of my time is devoted to dairy practice, especially to work on mastitis. Fifteen years of this type of practice makes me realize the great need that exists for veterinarians to better

inform themselves and to pool their efforts for the control of this infection. And now, as we are headed for greater milk production, the services of well trained veterinarians in this field are of paramount importance to the dairy industry.

As has already been stated, in my diagnosis reliance is placed upon microscopic findings. A milk sample in a sterile container is taken from each quarter; incubated; a smear made, stained and examined. A leucocyte count is also made and any quarter showing a count of 500,000 is classified as suspect. A sample from that quarter is taken and examined every four to seven days until some change is noted or infection found. Any quarter showing a count of 1,000,000 or more leucocytes is classified as diseased and is treated as such. In most cases, the microscopic examination of two or three milk samples at four to seven day intervals will give a reliable picture of the pathological condition of the quarter, while in a large percentage of cases showing a count of 1,000,000 or more leucocytes, the invading organism, either primary or secondary, will be found. The microscope is an absolute necessity in dealing with infectious mastitis. Except in advanced cases, no operator can tell with any degree of accuracy the pathological condition of the udder by physical examination. Neither can he tell by any other test the leucocyte count or the type of invading organism. In my practice a cow is not condemned unless it is clear, upon physical examination, that she is beyond medical aid, that is, if suppuration has taken place and the udder tissue has broken down to the extent of a rupture of the quarter with extensive abscess formation. In such cases it would, of course, be useless to attempt treatment. However many cases, where the quarter upon the first microscopic examination showed a leucocyte count of 10 million, have been treated successfully. Any quarter showing a one million leucocyte count is regarded as a danger signal which necessitates taking the cow from the milking line and giving treatment at once unless the pathological condition of the quarter is such as to render it useless.



Treatment

The treatment of mastitis varies greatly in different cases and certainly requires, first of all, a correct diagnosis. This places a heavy responsibility upon the veterinarian because it demands proper equipment, such as an abundance of sample bottles that can be thoroughly cleaned and sterilized; avoidance of contamination of the sample and misleading results; an ample supply of slides etched so that proper identification of the quarter and of the animal can be recorded on each slide to avoid mistaken identity; a complete book record of each ear tag and one of each quarter sampled and, most important of all, a modern microscope.

For years, many veterinarians held that infectious mastitis could not be successfully treated and even today there are some who doubt that any treatment will result in a permanent cure. This is not an up-to-date attitude.

In acute infectious mastitis (showing streptococci on microscopic examination) the following treatment is recommended: if the animal comes down suddenly with one or two swollen, inflamed quarters and a high temperature (105-106° F.), 250cc of a 1-1000 aqueous solution of Mercuric Succinimide is given intravenously. This usually lowers the temperature from two to three degrees in 24 hours. If the temperature is still more than 104° F. the dose is repeated in 24 hours. This nearly always brings the temperature to a safe level. The owner is instructed to use hot packs wrung from a

Record of Routine examination of a Dairy Herd of 43 Cows

Cow No.	Quarter	Physical Examination	Leucocyte Count	Direct Microscopic	Cultural Microscopic	Organism Pure Culture	Post Mortem Ex
109814	RF	Normal to Feel	30,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	90,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	20,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	300,000	Negative	Negative	No Growth	Cut Section Normal
109815	RF	Nodules Indurated	390,000	Negative	Long Chain Strep	Streptococcus	Pus in Milk
	RH	Small Abscesses	5,700,000	Negative	Long Chain Strep	Streptococcus	Pus Foci in Tissue
	LH	Indurated Swollen	2,700,000	Negative	Long Chain Strep	Streptococcus	Small Foci Pus in Milk
	LF	Slightly Indurated	1,400,000	Negative	Long Chain Strep	Streptococcus	Cut Section Normal
109816	RF	Slightly Indurated	840,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Slightly Indurated	27,000,000	Negative	Long Chain Strep	No Growth	Small Pus Foci
	LH	Slightly Indurated	10,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
	LF	Slightly Indurated	500,000	Negative	Negative	No Growth	Cut Section Normal
109817	RF	Normal to Feel	90,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Indurated Swollen	250,000,000	Few Long Chain	Long Chain Strep	Streptococcus	Large Pus Foci
	LH	Slightly Indurated	60,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	100,000	Negative	Negative	No Growth	Cut Section Normal
109818	RF	Normal to Feel	220,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Dry Abscesses	Dry	No Smear	No Culture	No Growth	Serum Atrophied
	LH	Small Nodules	20,000,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
	LF	Normal to Feel	480,000	Negative	Negative	Negative	Cut Section Normal
109819	RF	Slightly Indurated	840,000	Negative	Long Chain Strep	No Growth	Trace of Pus
	RH	Slightly Indurated	720,000	Negative	Long Chain Strep	No Growth	Trace of Pus
	LH	Normal to Feel	120,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	200,000	Negative	Negative	No Growth	Cut Section Normal
109820	RF	Dry	No Count	No Smear	No Culture	No Growth	No Secretion Atrophied
	RH	Dry	No Count	No Smear	No Culture	No Growth	No Secretion Atrophied
	LH	Normal to Feel	190,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	7,200,000	Negative	Negative	No Growth	Cut Section Normal
109821	RF	Indurated Swollen	840,000	Negative	Long Chain Strep	Streptococcus	Small Nodules
	RH	Indurated Swollen	1,100,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
	LH	Slightly Indurated	990,000	Negative	Long Chain Strep	Streptococcus	Trace Pus
	LF	Slightly Indurated	1,800,000	Negative	Long Chain Strep	Streptococcus	Small Nodules
109822	RF	Slightly Indurated	10,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Quarter Swollen	1,100,000	Negative	Long Chain Strep	No Growth	Pus in Quarter
	LH	Swollen Indurated	310,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
	LF	Normal to Feel	30,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
109823	RF	Slightly Indurated	4,800,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
	RH	Normal to Feel	260,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	860,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Indurated Swollen	80,000,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
109824	RF	Slightly Indurated	5,600,000	Negative	Negative	No Growth	Small Nodules in Tissue
	RH	Slightly Indurated	4,500,000	Negative	Negative	No Growth	Small Nodules in Tissue
	LH	Slightly Indurated	3,500,000	Negative	Negative	No Growth	Small Nodules in Tissue
	LF	Slightly Indurated	5,100,000	Negative	Negative	No Growth	Small Nodules in Tissue
109825	RF	Normal to Feel	60,000	Negative	Negative	No Growth	
	RH	Abscesses	38,000,000	Negative	Negative	No Growth	Abscesses
	LH	Normal to Feel	4,500,000	Negative	Negative	No Growth	P. M. On This Cow Made
	LF	Normal to Feel	60,000	Negative	Negative	No Growth	By Dr. J. L. Orr. U.S.B.A.I.
109826	RF	Multiple Abscesses	Too Many to Count	Long Chain Strep	Long Chain Strep	Streptococcus	Large Abscesses
	RH	Indurated Swollen	5,000,000	Negative	Long Chain Strep	No Growth	Small Nodules
	LH	Slightly Indurated	6,500,000	Negative	Long Chain Strep	No Growth	Small Pus Foci
	LF	Slightly Indurated	10,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
109827	RF	Slightly Indurated	770,000	Negative	Negative	No Growth	Small Nodules
	RH	Indurated Swollen	15,000,000	Negative	Long Chain Strep	Streptococcus	Pus in Quarter
	LH	Slightly Indurated	3,300,000	Negative	Long Chain Strep	Streptococcus	Pus in Quarter
	LF	Normal to Feel	860,000	Negative	Negative	No Growth	Small Nodules
109828	RF	Slightly Indurated	260,000	Negative	Negative	No Growth	Small Nodules
	RH	Slightly Indurated	680,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Slightly Indurated	920,000	Negative	Negative	No Growth	Small Nodules
	LF	Slightly Indurated	180,000	Negative	Negative	No Growth	Cut Section Normal
109829	RF	Normal to Feel	170,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	340,000	Negative	Negative	No Growth	Discoloration
	LH	Normal to Feel	160,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
	LF	Normal to Feel	790,000	Negative	Negative	No Growth	Discoloration
109830	RF	Indurated Swollen	8,700,000	Negative	Long Chain Strep	Streptococcus	Pus Thru Quarter
	RH	Indurated Swollen	3,300,000	Negative	Long Chain Strep	No Growth	Pus Thru Quarter
	LH	Indurated Swollen	3,000,000	Negative	Long Chain Strep	No Growth	Discoloration Tissue
	LF	Indurated Swollen	4,300,000	Negative	Long Chain Strep	Streptococcus	Pus Nodules
109831	RF	Indurated Swollen	100,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Indurated Swollen	70,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Thick Pus	Pus No Count	Negative	Long Chain Strep	Streptococcus	Large Pus Foci
	LF	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
109832	RF	Normal to Feel	1,800,000	Negative	Negative	No Growth	Pus in Tissue
	RH	Normal to Feel	2,100,000	Negative	Negative	No Growth	Pus in Tissue
	LH	Normal to Feel	1,800,000	Negative	Negative	No Growth	Pus in Tissue
	LF	Normal to Feel	660,000	Negative	Negative	No Growth	Cut Section Normal
109833	RF	Indurated Swollen	2,700,000	Negative	Long Chain Strep	Streptococcus	Pus Foci
	RH	Indurated Swollen	5,100,000	Negative	Long Chain Strep	Streptococcus	Pus Foci
	LH	Slightly Indurated	90,000	Negative	Negative	No Growth	Small Nodules
	LF	Slightly Indurated	150,000	Negative	Long Chain Strep	No Growth	Small Nodules
109834	RF	Normal to Feel	320,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	550,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Indurated Swollen	1,500,000	Negative	Long Chain Strep	No Growth	Pus in Milk
	LF	Normal to Feel	330,000	Negative	Negative	No Growth	Cut Section Normal
109835	RF	Small Abscesses	660,000	Negative	Negative	No Growth	Small Nodules
	RH	Large Abscess	Pus	Negative	Negative	No Growth	Large Abscess
	LH	Slightly Indurated	300,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Slightly Indurated	740,000	Negative	Long Chain Strep	No Growth	Cut Section Normal

109836	RF	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	40,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	30,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	1,000,000	Negative	Negative	No Growth	Small Pus Foci
109837	RF	Abscesses	9,000,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
	RH	Indurated Swollen	300,000	Negative	Long Chain Strep	Streptococcus	Small Nodules
	LH	Small Abscesses	Too Many to Count	Long Chain Strep	Long Chain Strep	Streptococcus	Small Pus Foci
	LF	Indurated Swollen	12,000,000	Negative	Long Chain Strep	Streptococcus	Small Nodules
109838	RF	Indurated Swollen	280,000	Negative	Long Chain Strep	Streptococcus	Small Nodules
	RH	Indurated Swollen	13,000,000	Negative	Negative	No Growth	Small Pus Foci
	LH	Discharging Pus	Pus	Negative	Negative	No Growth	Large Pus Foci
	LF	Normal to Feel	100,000	Negative	Negative	No Growth	Cut Section Normal
109839	RF	Normal to Feel	740,000	Negative	Long Chain Strep	Streptococcus	Cut Section Normal
	RH	Normal to Feel	340,000	Negative	Negative	Negative	Cut Section Normal
	LH	Normal to Feel	9,600,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
	LF	Normal to Feel	470,000	Negative	Negative	Negative	Cut Section Normal
109840	RF	Normal to Feel	300,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	100,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
	LH	Normal to Feel	130,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	40,000	Negative	Negative	No Growth	Cut Section Normal
109841	RF	Normal to Feel	30,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	90,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	160,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
109842	RF	Normal to Feel	40,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	100,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	140,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	100,000	Negative	Negative	No Growth	Cut Section Normal
109843	RF	Normal to Feel	12,000,000	Negative	Negative	No Growth	Small Nodules
	RH	Dry	Dry	No Smear	No Culture	No Growth	Atrophied
	LH	Abscessed Swollen	7,200,000	Long Chain Strep	Long Chain Strep	Streptococcus	Abscesses
	LF	Normal to Feel	100,000	Negative	Negative	No Growth	Cut Section Normal
109844	RF	Normal to Feel	4,100,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
	RH	Normal to Feel	2,200,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
	LH	Indurated Swollen	25,000,000	Long Chain Strep	Long Chain Strep	Streptococcus	Small Pus Foci
	LF	Normal to Feel	1,400,000	Negative	Long Chain Strep	Streptococcus	Cut Section Normal
109845	RF	Small Abscesses	3,600,000	Negative	Long Chain Strep	Streptococcus	Pus in Quarter
	RH	Scanty Secretion	No Count	Negative	Negative	No Growth	Atrophied
	LH	Normal to Feel	160,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	60,000	Negative	Negative	No Growth	Cut Section Normal
109846	RF	Small Abscesses	910,000	Negative	Long Chain Strep	Streptococcus	Pus in Quarter
	RH	Indurated Swollen	14,000,000	Negative	Negative	No Growth	Pus in Quarter
	LH	Indurated Swollen	9,800,000	Negative	Long Chain Strep	Streptococcus	Pus in Quarter
	LF	Normal to Feel	740,000	Negative	Negative	No Growth	Cut Section Normal
109847	RF	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	20,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	90,000	Negative	Negative	No Growth	Cut Section Normal
109848	RF	Normal to Feel	280,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	260,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	120,000	Negative	Negative	No Growth	Small Nodules
	LF	Normal to Feel	160,000	Negative	Negative	No Growth	Cut Section Normal
109849	RF	Indurated Swollen	1,100,000	Negative	Negative	No Growth	Small Pus Foci
	RH	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	10,000	Negative	Negative	No Growth	Cut Section Normal
109850	RF	Indurated Swollen	3,900,000	Negative	Long Chain Strep	Streptococcus	Small Pus Foci
	RH	Dry	No Count	No Smear	No Culture	No Growth	Atrophied
	LH	Large Abscesses	Too Many to Count	Long Chain Strep	Long Chain Strep	Streptococcus	Large Abscesses
	LF	Large Abscesses	10,000,000	Long Chain Strep	Long Chain Strep	Streptococcus	Small Pus Foci
109851	RF	Indurated Swollen	2,500,000	Negative	Long Chain Strep	Streptococcus	Pus Foci
	RH	Indurated Swollen	24,000,000	Negative	Long Chain Strep	Streptococcus	Pus Foci
	LH	Indurated Swollen	50,000,000	Negative	Long Chain Strep	Streptococcus	Pus Foci
	LF	Indurated Swollen	16,000,000	Negative	Long Chain Strep	Streptococcus	Cut Section Normal
109852	RF	Normal to Feel	800,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	1,400,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	20,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	120,000	Negative	Negative	No Growth	Cut Section Normal
109853	RF	Normal to Feel	20,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	30,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	1,000,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Normal to Feel	100,000	Negative	Long Chain Strep	No Growth	Cut Section Normal
109854	RF	Normal to Feel	20,000	Negative	Negative	No Growth	Cut Section Normal
	RH	Normal to Feel	60,000	Negative	Negative	No Growth	Cut Section Normal
	LH	Normal to Feel	2,700,000	Negative	Negative	No Growth	Small Pus Foci
	LF	Normal to Feel	40,000	Negative	Negative	No Growth	Cut Section Normal
3	RF	Badly Indurated	Too Many to Count	Long Chain Strep	Long Chain Strep	Streptococcus	Many Pus Foci
	RH	Dry	No Count	No Smear	No Culture	No Growth	Atrophied
	LH	Indurated	630,000	Negative	Negative	No Growth	Cut Section Normal
	LF	Badly Indurated	Too Many to Count	Long Chain Strep	Long Chain Strep	Streptococcus	Many Pus Foci
2	RF	Normal to Feel	680,000	Negative	Negative	No Growth	No Post Mortem
	RH	Normal to Feel	170,000	Negative	Negative	No Growth	on This
	LH	Normal to Feel	1,100,000	Negative	Long Chain Strep	Streptococcus	Animal
	LF	Normal to Feel	500,000	Negative	Negative	No Growth	

SUMMARY—Physical examination	Condemned	31 Cows—72.1%
Leucocyte count—1,000,000 or more	Condemned	34 Cows—79.3%
Streptococcus on direct count (breed smear)	Condemned	7 Cows—16.3%
Streptococcus in culture	Condemned	29 Cows—67.4%
Postmortem examination	Condemned	34 Cows—79.3%

NOTE—86.5% of all quarters showing evidence of disease on postmortem examination showed streptococci on microscopic examination of culture. 48 hours incubation. In this work no attention was given to organisms other than streptococci. For by the microscopic examination of thousands of milk samples from hundreds of dairy cows it appears that 90% of all infectious mastitis is primarily streptococcic.

This chart is representative of many herds examined and is the regular procedure followed in testing for mastitis, except for postmortem examination which opportunity to perform rarely occurs.

solution, as hot as can be handled, of one pound of Epsom salt dissolved in 10 quarts of water. Fomentation should be continued for 20 minutes every two hours. In 10 hours further treatment is administered and at this time the quarter is milked dry and 10cc of novoxil liquid is injected into the teat canal with a four-inch blunt needle. The owner is advised to milk out the quarter in 12 hours and then repeat the hot applications morning, noon and night for 20 minutes each. In four hours a return trip is made and a second injection of novoxil (10cc) is given. At this time there is usually a marked improvement in the quarter and the temperature is around normal. Each time the animal is injected with novoxil liquid 5cc of combined *Streptococcus pyogenes* (50%), *Corynebacterium pyogenes* (30%), *Staphylococcus aureus* (10%) and *Escherichia Coli* (10%) bacterin is administered subcutaneously. Stubborn cases usually require a third udder injection of this liquid 72 hours later.

In chronic mastitis, showing streptococci on microscopic examination, 10cc injections of novoxil liquid are made up the teat canal and 5cc of the combined bacterin is administered. This is repeated in 72 hours and if necessary a third time after another 72 hours. In quarters showing staphylococci or coli, 40cc of a solution of azamine (20 grams to 300cc of hot distilled water) is injected into the teat canal and is followed by 5cc of the combined bacterin. Treatment is repeated in 72 hours and again 72 hours later if necessary. In 60% of the cases two injections are sufficient although about 10% require a third. The remaining 30% usually fail to make a complete recovery and are slaughtered because of the loss of one or more quarters.

Taking into consideration all cases treated and observations made during the past 18 months I have found that in dairies where the animal received careful and prompt attention best results were obtained when it was given internal treatment in addition to the local treatment described in the foregoing. This consisted of 240 grains of sulfanilamide three times daily for three days, then discontinued for three days and repeated.

Milk was our most valuable single food 50 years ago, as it is today. But 50 years ago it was by no means "nearly perfect." At that time polluted milk caused more sickness and death than all other foods combined.

Certified milk never has been a large part of the total milk consumption of any city —2% to 5% at most. Yet the dairies which attained the standards required for certification were pioneers who blazed a trail for the common good. The sanitary conditions, of which they formerly were the sole examples in the milk industry, now are equalled by most dairies as a matter of routine.—*Thomas Parran, Surgeon General U. S. Public Health Service.*

* * * *

The first recorded importation of the Jersey cow into America was 1850, although she has been a native inhabitant of the island of Jersey for more than 500 years. Since their first introduction there have been born in the U. S. more than 1,500,000 registered Jerseys. One of the most famous Jersey herds is that of Biltmore Farm, North Carolina, which has about 600 head of fine cows which produce 3,000,000 pounds of milk yearly.

* * * *

Legal View on Milk Deficiency and Mastitis

In view of the panel scheme introduced for the control of certain diseases in dairy herds, including mastitis, a decision delivered by Sheriff Garrett at Ayr (Ireland) recently is of special interest.

The case arose out of a charge against Mr. Thomas M'Farlane, farmer, Roan, Kirkmichael, for selling milk showing a deficiency in solids-not-fat below legal standard. One part of the defense was based on the existence of mastitis. In his decision Sheriff Garrett said the whole problem of the effects of disease and other factors on the composition of milk offered a wide field for research and control. He was satisfied that the respondent had entirely discharged the onus placed upon him by leading evidence from which it could be reasonably inferred that the deficiency was due to mastitis in his herd. Accordingly he found the defendant *not guilty.—Vet. Record.*

Enteric Diseases of Swine*

By F. M. WILSON,
Mechanicsville, Iowa

ENTERIC diseases of swine are undoubtedly the greatest obstacle to successful and profitable swine production today. Such diseases cause enormous loss of life. They leave thousands of stunted unprofitable pigs. The owner is an apt victim for the mineral peddler with his sure-cures, that, in most cases, are absolutely worthless in treating the condition for which they are prescribed. To properly combat such conditions requires large expenditures for buildings, fences, and equipment as well as labor.

Up to the present, we recognize seven different types of enteritis, namely:

1. Enteritis of sucklings (white scours) due to bacteria of the colon typhoid group.
2. True necrotic enteritis due to primary infection with *Salmonella suipestifer*, with constant secondary invasion by *Actinomyces necrophorous*.
3. Pig Pellagra due to Nicotinic Acid (vitamin P.P. factor) deficiency.
4. Hemorrhagic Enteritis due to unknown causes, probably a virus.
5. Enteritis of a mild type due to invasion by swine strains of coccidia.
6. Enteritis due to chemical irritants, as salt, mineral mixtures, metallic poisoning, etc.
7. Enteritis secondary to specific swine diseases such as hog cholera, erysipelas, anthrax, etc.

Contributing Factors

Swine breeding and feeding in the corn belt has reached a high stage of efficiency. But swine sanitation at best is in most places still vestigial or non-existent. Countless herds of growing swine still have access to contaminated lots heavily seeded with parasite eggs and bacteria, in spite of the fact that it is common knowledge that swine more than any other animal require clean ground, clean water and clean feeding methods. The practice of crowding pigs by heavy feeding on highly concentrated feeds from birth, and taxing their digestive organs to the limit, renders them more susceptible to intestinal disturbances.

During the past fifteen years, the establishment of numerous community sales have contributed heavily to the spread of swine diseases, especially of the intestinal type. Many apparently healthy hogs are active or passive carriers, capable of infecting home herds.

White Scours

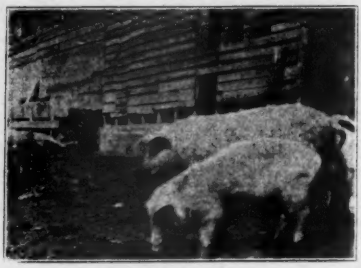
One of the most important enteric diseases of swine is white scours in baby pigs. The onset is often very sudden, following storms or periods of wet chilly weather and, at times, the losses mount to enormous proportions.

Predisposing factors in outbreaks of pig scours are: Defective rations of the sow both during the prenatal and postnatal periods, the concurrent presence of suckling anemia, markedly deficient vitamin A content of the sow's ration and lack of hog-house sanitation.

The symptoms of white scours are too well known to merit much mention. It usually appears in pigs two to four or five weeks of age. They show rough hair coats, marked depression, hind quarters smeared with whitish, pasty, semi-liquid feces. We frequently see a high incidence of pneumonia—a condition traceable to the same environmental and bacterial factors that cause the

* Presented at the Midwest Veterinary Conference, Kansas City, Mo., June 30, 1942.

intestinal upset. Postmortem examination reveals a gastroenteritis of more or less severity and often evidence of pneumonia.



Necrotic enteritis is the greatest single obstacle to profitable swine production

Treatment: Firstly, correct hog-house sanitation. It is especially important to eliminate undue moisture around the premises. Provide plenty of sunlight and exercise. Correct coincidental anemia by feeding iron and copper. Destroy all hopelessly sick pigs. In our practice, we medicate the sows with a powder consisting of equal parts powdered catacheu and sodium bicarbonate given in two-dram doses in the feed, twice daily. We do not reduce the feed as we have found that when feed is increased again, we often have a recurrence of the scours.

When the infection is extremely virulent, it may be necessary to administer enteritis mixed bacterin or anti-white scour serum along with the medication. However, the owner is usually unwilling to go to that much expense, except in the case of valuable pure-bred litters.

Necrotic Enteritis

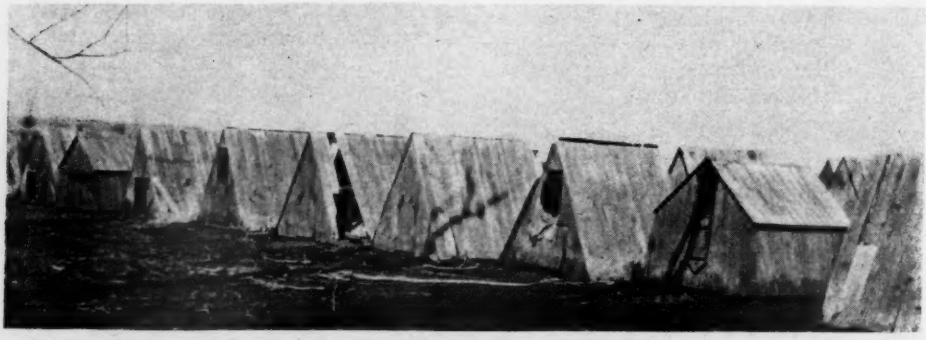
The condition known as necrotic enteritis is undoubtedly the greatest single obstacle to profitable swine production on many Midwest farms.

The fact that we have no preventive vaccination against it; the immense damage to growth and gain; the difficulty and expense of instituting sanitary measures for prevention; the extra labor; the thousands of dollars expended on worthless nostrums and the scattering of infection to clean premises by the purchase of feeder pigs, are factors that contribute to a loss of millions of dollars annually from necrotic enteritis.

The well-known symbiosis between *Salmonella cholerasuis* and hog-cholera virus is undoubtedly the greatest hazard in immunizing swine against hog cholera.

Murray and Biester have demonstrated clearly that necrotic enteritis is caused by primary invasion with *Salmonella suipestifer* and that the anaerobe *Actinomyces necrophorous* is a constant secondary invader.

Clinical Picture: In the typical outbreak, a few pigs will seem to pass liquid or semi-liquid, dark-colored feces, which may run down over the hind quarters. There may be marked variation of temperature, appetite, etc. As the disease progresses, there is marked dehydration with consequent loss of weight; the diarrhea continues and often cheese like casts of pseudomembrane appear in the feces. Some pigs die; others live on indefinitely as unprofitable animals.



In necrotic enteritis, swine should be placed on a cement floor—movable houses are a more frequently available second choice

Autopsy: Upon necropsy, we find the enteritis confined to the cecum and colon. The stomach is often filled with food but the mucous membrane often shows hemorrhage and, at times, ulceration. The whole length of the large bowel is thickened and the mucous coat is piled high with a cheese-like exudate which, when scraped off, leaves a raw bleeding surface. The contents of the large intestine is usually liquid and very fetid, however, at times we find the feces molded in balls that adhere to the mucous coat. The small intestine shows little change, unless it be a slight catarrhal exudate. Often the anterior lobes of the lungs are pneumonic.

Treatment: The routine treatment with most veterinarians, for the past few years, has been the feeding of one of the commercial alkaline mixtures with soaked whole oats. In many herds, this treatment has sufficed. However, such treatment does not seem to be sound. We know that a pig with acute necrotic enteritis has a digestive tract that is functioning subnormally. We also know that whole, soaked oats is not a balanced diet and it is difficult of digestion. Better practice is to give a liquid or semi-liquid feed consisting of buttermilk and middlings, ground wheat or ground hulled oats, in order to properly nourish the animal and lessen the load on the damaged intestine. Recently the feeding of salt in rather large amounts has been gaining more or less repute.

The observations of Murray and Biester during their experimental studies of the disease furnish an important suggestion on treatment. They found that field cases of the disease improved rapidly when placed in cement floored experimental pens that were cleaned and washed daily with a hose. In fact, it was very difficult to maintain the disease, under such conditions, a sufficient time for their studies to be completed.

It is very important to isolate the affected pigs and to place them, and also the remainder of the herd, in clean quarters where proper sanitation can be maintained.

Pig Pellagra

About two years ago, workers in Michigan and Pennsylvania described an enteritis of growing pigs due to lack of nicotinic acid in the diet.

Symptoms: In pig pellagra, the onset is slow; there is gradual loss of weight, watery diarrhea, dermatitis of the ears and body and little, if any, elevation of temperature.

Autopsy: The stomach is empty, the mucosa is reddened but there are no ulcers. The cecum and colon show necrosis of the mucosa but there is absence of acute inflammation. Other organs show little change.

Treatment: The treatment of this condition consists of correction of the diet by the feeding of light easily digested foods with the addition of brewer's yeast or nicotinic acid.

Haemorrhagic Enteritis

During the past few years, we have noted, with increasing frequency, a severe form of enteritis that affects large numbers of pigs or hogs of all sizes and is quickly fatal.

Field Picture: The onset is very sudden often the owner finds a large hog dead—one that he had not even noticed to be off feed. Most animals show a marked diarrhea with the passing of more or less pure blood. The droppings have been described as having a tomato catsup appearance. Temperatures may be considerably elevated in the beginning but soon drop to near normal. We have noted a tendency of the animal to walk with the back arched and the abdominal muscles tense, also to twist the tail both preceding and during defecation.

Autopsy: Cases that have died of

In many places, swine sanitation is practically non-existent. These hogs had to step high to navigate the mud and get about in this feed lot

View of Brock Farm in Iowa, where "salt" treatment for hemorrhagic dysentery and other forms of enteritis in swine originated

hemorrhagic enteritis often show an acute gastritis on necropsy. The walls of the cecum and colon are thickened and edematus; the mucosa reveals an extreme hemorrhagic inflammation with the oozing of free blood from the mucosa. At times, the intestinal tract may be filled with nearly pure blood; there is gross enlargement and congestion of the mesenteric lymph glands. As the disease progresses there is evidence of invasion of *Actinomyces necrophorous* and the interior of the bowel closely resembles that of necrotic enteritis.

Treatment: If possible, get the swine on a cement floor and have it cleaned thoroughly once a day. We have tried many treatments for this condition; the most satisfactory to date has been the feeding of salt. The first 24 hours we give them only water containing one ounce of sodium bicarbonate per pig. Then we put them on a thick slop consisting of buttermilk and ground wheat or wheat middlings with one gallon (approximately ten pounds) of a good grade of stock salt to fifty gallons of slop. We feed this slop for four days, then remove the salt for two days and then repeat it for another four days. Be absolutely sure that a plentiful supply of fresh water is easily available at all times. At the end of the 10-day period, we gradually increase the solid feed. If the condition appears to be flaring up again, we repeat the salt treatment.

It should be needless to emphasize the importance of strict isolation for a period of at least three weeks of newly purchased feeder pigs, but this practice is too often neglected by many of our clients.

Coccidiosis

Several species of coccidia have been found in swine. Unlike kindred diseases of fowls, swine strains do not produce a bloody diarrhea. Pigs with heavy infestation closely resemble in appearance pigs with heavy ascaris infestation. They have pot bellies, rough hair, pale eyes, grow slowly, and experience general unthriftiness. The lesions of coccidiosis in swine are confined largely to the small intestine and are characterized by a light, pseudomembranous exudate and a low-grade inflammation.

Treatment: Move the herd to clean ground frequently, especially avoid pens containing surface puddles of water where the swine may drink, and give an intestinal astringent such as copper sulphate or catecheu in the feed.

Enteritis Due to Chemical Irritants

Enteritis due to chemical irritants is usually diagnosed by the history of normal temperature, nervous symptoms, etc. The most common causes are salt, mineral mixtures, etc. The treatment consists of removing the cause and feeding milk and linseed meal. In pigs too sick to take food or water, we sometimes think we get some benefit from large doses of mineral oil given through a stomach tube.

Enteritis Secondary to Specific Swine Diseases

The symptoms of hog-cholera, erysipelas, etc., are properly considered under discussions of these diseases. However, at times suipestifer infection may be very hard to differentiate from hog-cholera. Close observation with herd history is helpful.

Conclusion

The various enteric diseases of swine are probably the most serious obstacle to profitable swine production at the present time. The treatment of these conditions is probably the most disappointing to the practitioner of any phase of his practice.

Successful treatment depends largely on a careful diagnosis, good sanitation and careful feeding on an easily digested diet.

In swine, not immune to cholera, always consider hog cholera before making a diagnosis. Where there is any doubt administer large doses of anti-hog-cholera serum.

Preliminary Studies on the Use of Phenothiazine in the Control of Lung Worms in Sheep and Goat

By D. F. EVELETH, M. W. EVELETH, and R. GIFFORD*

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PARASITISM in combination with infectious diseases and malnutrition often causes the diagnostician considerable difficulty. Sheep appear to be highly susceptible to a large variety of parasites and infectious agents which produce disease syndromes that are very similar in their clinical aspects. In earlier publications[1] we have discussed the results of some of our findings regarding Johne's disease and intestinal parasites. In both of these conditions loss of flesh and diarrhea are common symptoms. A later report[2] confined itself more to the abscess formations in cattle and sheep in which *Bacillus subtilis* was a constant finding. In the latter studies, the possibility of parasite larvae acting as carriers of infection were considered. These studies have been continued in an attempt to determine the role of lung worms in the production of diarrhea, emaciation, and abscess formation in naturally infected sheep, as well as to formulate a control program against this parasite.

The life history of the large or thread lung worm is simple. The ova are embryonated at the time they are deposited by the female parasite. Many free larvae, as well as ova, are frequently found in the mucus of the air passages. These larvae and ova are then coughed up and disseminated in the nasal discharges or swallowed and passed out in the feces. On the soil, especially in moist places, the larvae molt and develop. They later crawl up blades of grass to be eaten by the host. From the intestines the larvae enter the lymph system where they develop in the mesenteric nodes. The lymph nodes, as a result of many infestations of larval lung worms, may be completely destroyed with calcified tissue replacing the normal lymphoid tissue. The larvae then migrate to the lungs where they leave the blood system by rupturing the capillaries. After entering the alveoli the larvae grow and eventually migrate to the bronchi and trachea. Guberlet[3] found that an artificially infected lamb showed clinical symptoms in about three weeks and that in about five weeks larvae were being expelled in the lamb's feces.

During the late spring and summer there are frequently heavy death losses of lambs and ewes, as well as of kids and does, from verminous pneumonia. Many of these animals, when examined postmortem, show no evidence of any infectious disease, while in others it is possible to demonstrate the lesions and organisms of pasteurellosis. Other cases present the typical lesions and organisms of caseous lymphadenitis. The more chronic type of lung worm disease manifests itself by diarrhea and coughing with or without the usual symptoms of pneumonia.

Many of the older sheep have lymph nodes that are definitely calcified, while in others pus only is present. In some cases the lungs are studded with small abscesses. Adhesions are plentiful in the thoracic cavity. Edema may be generalized and excessive amounts of clear fluid are found in the thoracic and abdominal cavities. The pericardial sac contains excess fluid and all tissues have a gelatinous appearance. The degree of pneumonia is variable but usually very advanced. Some lungs have practically no normal appearing tissue.

Most of the sheep and goats which we have examined have been treated with phenothiazine or other anthelmintics for the gastro-intestinal parasites.

Some sheep men have losses up to 10%

* Research Paper No. 747. Journal Series, University of Arkansas. Published with the approval of the Director of the Arkansas Agricultural Experiment Station.

[1] Eveleth, D. F., R. Gifford and C. H. Anthony, 1942. Johne's disease of sheep. *Vet. Med.* 37:6, pp. 241-247. Eveleth, D. F., and J. L. Reineccius, 1940. Enteritis in sheep and swine; reaction to johnin. *Vet. Med.* 35:9, p. 500.

[2] Schweiger, L. B., D. Trainer and D. F. Eveleth (in press). Isolations of *Bacillus subtilis* from actinobacillotic-like lesions in cattle and sheep. Amer. *Jnl. Vet. Res.*

[3] Guberlet, J. E., 1919. Preliminary report on the life history of the lung worm. *Jnl. A.V.M.A.* 55:8, pp. 621-627.

of their flocks due to pneumonia associated with heavy lung worm infestation. Another symptom which is not as spectacular as

Fig. 1. A heavily parasitized mature ewe showing emaciation and edema

the death losses, is the failure to fatten on the part of the lambs. In one herd, in particular, the lambs were given phenothiazine regularly by mouth, allowed good pasture, and fed an adequate grain supplement; still they could not be fattened. There were no death losses in this flock of lambs, but many showed evidence of a chronic cough and intermittent diarrhea.

Measures for the control of lung worms in sheep have, for the most part, been rather unsuccessful. Pasture rotation is quite satisfactory provided it is possible to eliminate the chronic carrier. Most investigators are agreed that the larvae of the lung worms will die within a six months period if animals are kept off the pastures. As old sheep are frequently infested with lung worms, the re-introduction of sheep onto the pastures immediately recontaminates them.

Medicinal treatment has usually been ineffective. The high parasiticidal action of phenothiazine and its relatively low toxicity for mammals warranted its trial as an anthelmintic for the control of lung worms in sheep and goats.

The efficacy of phenothiazine in killing helminth parasites of mammals has been demonstrated in a large number of trials. These investigations have, in general, dealt with the oral administration of the drug in doses of varying sizes, and the later determination of its efficiency in removing or inactivating various kinds of gastro-intestinal parasites.

Problems of toxicity have arisen from deaths occurring during the routine worming of various species of animals. It is apparently of very low toxicity for ruminants as reports of poisoning are rare in sheep, goats and cattle.

It has been considered that the intratracheal injection of phenothiazine will constitute a possible approach to the problem of controlling lung worms in sheep and goats. The small volume of the air passages in which lung worms are found make it possible to use only a small quantity of the parasiticide.

Phenothiazine is soluble in alcohol but relatively insoluble in glycerol. In a mixture of equal parts of alcohol and glycerol, some

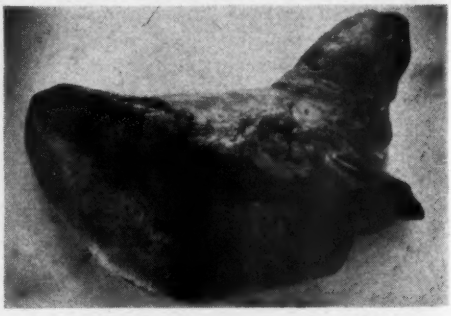


Fig. 2. The lung of a six-year-old ewe showing hyperemia and edema

phenothiazine is dissolved and the viscosity of the solvent material is such that a fairly stable suspension is made by stirring phenothiazine into the glycerol-alcohol mixture. An arbitrary ratio of 20gm of unconditioned phenothiazine to 100cc of glycerol-alcohol was chosen to use in experimental tests.

Preliminary experiments were conducted with chickens as test animals. The phenothiazine mixture was injected in amounts varying from 0.1-0.5cc for 1½ to 2 pound birds. These chickens were then killed and the lungs observed. Those birds, killed after a period of 24 hours, showed only some hyperemia of the lungs with small particles of phenothiazine lodged in the smaller bronchioles. In no cases were the birds killed

by the injections and no severe pneumonia was observed.

The phenothiazine was next injected into goats and sheep that were not infested with lung parasites. The first goat was given 5cc intratracheally and killed 48 hours later. The lungs were hyperemic and did not collapse completely. There were no pneumonic areas. Goat No. 2 was given a 5cc dose and

Fig. 3. Same as Fig. 2 with bronchi open to show parasites and excess mucus

was killed 24 hours later. There were two small pneumonic spots in the frontal lobes and some unabsorbed phenothiazine in the smaller bronchioles.

The third trial was made on a 150-pound sheep; 12cc of the phenothiazine mixture being injected intratracheally. The animal immediately began to cough somewhat but was able to continue eating during the hour or so that it was observed. Seventy-two hours later the animal was killed. The lungs were hyperemic and a small pneumonic area was present in one frontal lobe. The lungs had a meaty appearance and did not collapse in a normal manner.

These experiments demonstrated the possibilities of intratracheal injections of phenothiazine as a means of combating lung worms.

In the fourth test, a severely emaciated ewe was submitted to the laboratory for diagnostic purposes. She had been given 26.5gm of phenothiazine by mouth five days before. The ewe had diarrhea and breathed very rapidly. Hemoglobin (Tallqvist) 70, temperature 102°F. Given 9cc of the mixture intratracheally and killed 24 hours later. The lungs were heavily studded with foci of purulent material and were distended and adherent to the ribs.

A few dead lung worms were found in the mucous, the trachea, and the larger

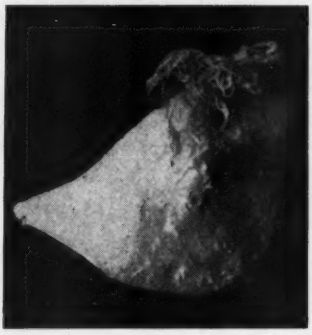


Fig. 4. A small piece of lung with lung worms in a small bronchiole

bronchi. The smaller bronchioles contained masses of live lung worms. The phenothiazine mixture had not penetrated deeply enough into the bronchioles to contact the large groups of lung worms.

In trial No. 5, a goat was given 10cc of the phenothiazine mixture intratracheally. Some coughing followed but it was not severe. When it was killed five days later, this animal showed some small pneumonic spots in the lower portions of the lungs and small particles of phenothiazine were found in the smaller bronchioles.

Experiments *in vitro* had demonstrated that the alcohol-glycerol suspension of phenothiazine inactivated sheep lung worms in less than one-half minute following contact of the mixture with the parasite.

The first field test was made on a large ram and two lambs that all showed evidence of lung worm infestation. The ram was given 10cc and the lambs 4cc each of the mixture by intratracheal injection. In all three there was an immediate clinical improvement as shown by increased appetite, weight, and activity. The ram died later from what appeared to be the effect of a new infestation of larvae as there were very few mature worms, although many small ones were found.

The next trial was made on five old ewes. These animals were all very debilitated and one was unable to stand. One ewe was

given supportive treatment of glucose and anti-pasteurella serum. Other sheep from this flock had previously been found to be suffering from caseous lymphadenitis in addition to a very heavy lung worm infestation. Of the five ewes treated only three showed clinical improvement and two died. The first died five days after the phenothiazine treatment. This was the ewe that had previously been down. The necropsy showed evidence of severe caseous lymphadenitis and pneumonia. All mature lung worms, as well as embryos in the mucus, were dead.

The other sheep died without showing symptoms other than the chronic cough and general listlessness. There were many abscesses in the lungs, and many lymph nodes, including the supramammary lymph nodes. Many of the bronchioles were packed solid with dead lung worms. These last two ewes were both considered to be in the terminal stages of pneumonia at the time they were treated and it is very doubtful if any type of medication would have helped them.

In a later field test 30 ewes and 12 lambs, all showing symptoms of severe lung worm infestation, the ewes were injected with 3cc and the lambs 2cc of the phenothiazine mixture. One badly debilitated lamb died three days later but the remainder of the flock showed clinical improvement. It was not possible to make a postmortem examination of the lamb that died.

Discussion

Phenothiazine in glycerol and alcohol kills both embryo and mature lung worms when administered into the lungs by way of the trachea. It will require much more experimental information as to dosage and frequency of treatment before it is possible to offer a complete control procedure. These preliminary findings indicate that in the absence of serious complicating factors the intratracheal injection of the phenothiazine causes no great harm to the sheep and is an effective parasiticide.

The best means of administration has not been found. It appears necessary for the phenothiazine to contact the worms in order to kill them. Thus, if the entire dose goes into one lobe of the lungs it is not as effective as though it entered all bronchioles. It was observed that those animals that struggled and coughed during the injection had the phenothiazine distributed more evenly in the lungs than those that did not. When the injection is made slowly it seems to be distributed over a larger area of the lungs than when it is injected rapidly. This probably results from the movements of the lungs during the respirations.

Summary

Preliminary studies indicate that lung worms are often serious parasites in Arkansas sheep flocks.

The intratracheal injection of phenothiazine in glycerol and alcohol has been found to kill lung worms *in vivo* with a minimum of damage to the host.

It is not advised to use intratracheal injections in sheep or goats suffering from advanced pneumonia or caseous lymphadenitis with or without pneumonic symptoms.

Where re-infestation is taking place constantly it will probably be necessary to treat at frequent intervals.

Some Fundamentals of Animal Disease Control*

By JAMES W. BENNER
New Mexico College of Agriculture and Mechanic Arts, State College, New Mexico

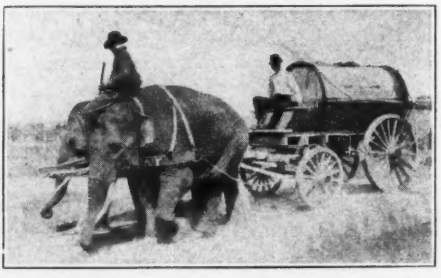
IN animal disease control, a correct diagnosis is fundamental. The animal and his environment present numberless possibilities for loss from unthriftiness, sickness and death and this list is enlarged as our knowledge of the animal in health and disease is increased. Some diseases of animals can be diagnosed quickly from observation and little history, but more require a thorough investigation. A veterinarian is best equipped to do this and it must be carried out systematically and carefully or matters having considerable bearing on the case may often be overlooked. The layman, in a large majority of cases, does not realize the many factors to be considered in making a diagnosis. When an owner has a sick animal, if any of the symptoms resemble anything he has ever seen or heard of, he is likely to make a guess. The neighbors also frequently make guesses. This kind of diagnosis is usually accomplished very quickly, and often very positively. If a veterinarian is called to see the patient, and he does not make as quickly a positive diagnosis, the owner and the other guessers, are disappointed and are inclined to think that the veterinarian doesn't know his business. When a veterinarian is called many owners want an immediate, definite diagnosis handed to them from one hand, and a magic cure from the other. However only charlatans and quacks follow this line of procedure on all diseases as few can be so quickly recognized. Because owners of unthrifty or sick animals want lightning diagnoses and infallible cures, the quack has flourished as a diagnostician and therapeutist.

In human medicine, where the patient has a sentimental value, the art and science of diagnosis has become highly specialized. A person with a puzzling disease, is taken to a hospital and runs the gauntlet of specialists before a diagnosis is made or treatment given. This specialization is on the genus *homo* only.

In veterinary medicine, one may be called upon to diagnose disease in any part of the anatomy of a variety of animals from a canary bird to an elephant, and except in pets with a sentimental value, the veterinarian is expected to keep the cost of his services well within the cash value of the animal.

It is obvious that, because of the large number of different types of animals he is called upon to treat, the services of a veterinarian cannot be on the same high plane of efficiency as can those of a group of specialists in human medicine.

Everyone should have some knowledge as to the extent to which science can be applied in the making of a diagnosis of disease. In the matter of animal disease, he should realize his own limitations and that the veterinarian is the logical man to help



A veterinarian is required to treat a wide variety of animals—from a canary to an elephant

him out. The veterinarian too should realize the limitations in his profession and frequently call for assistance upon specialists in other fields of science when faced with problems of science with which he is not familiar.

The accompanying outline has been taken, somewhat modified, from a book on

*Presented at the 22nd Annual Meeting of the American Association for the Advancement of Science, Southwestern Division, Las Cruces, N. M., Apr. 29, 1942.

clinical diagnosis by Malkmus. It has proved helpful to the writer in both clinical and postmortem examinations in the investigation of animal diseases. It denotes the systematic way in which the many factors involved in a diagnosis should be brought under consideration by the investigator.

Systematic Examination of an Animal To Establish a Diagnosis

I. History: Breeding, feeding, housing, sanitation, vaccination, isolation, etc.
II. Determining the present state of health.
  1. General Examination
    a. Description of patient for identification
      (1) Kind—Species
      (2) Breed
      (3) Sex
      (4) Age
      (5) Size
      (6) Color
    b. Characteristics or general appearance due to
      (1) Physical attitude,
      (2) Condition,
      (3) Conformation
      (4) Temperament
    c. Skin:
      (1) Soft, pliable, elastic and easily moved or hard, dry, leather-like and tight.
      (2) Hair short, fine and glossy, long, rough and bristling. Due to good care, bad care or disease.
      (3) Loss of hair (alopecia)
      (4) Sweating,
      (5) Reddened (inflamed)
      (6) Bluish-red (cyanotic)
      (7) Yellow (icteric)
      (8) Edema (fluid under the skin)
      (9) Emphysema (gas under the skin)
    d. Conjunctiva
    e. Temperature
  2. Special Examinations
    a. Circulatory system
    b. Lymphatic system
    c. Respiratory system
    d. Digestive system
    e. Urinary system
    f. Reproductive system
    g. Nervous system
    h. Locomotion
  3. Specific Examinations
    a. Diagnostic inoculations
      (1) Of the animal
      (2) Of laboratory animals
      (3) Of culture media
    b. Laboratory examination of blood
    c. Laboratory examination of secretions and excretions

For the history of an animal, which is often of greatest importance in diagnosis, the investigator must depend largely on the owner or attendant. A small bit of honest information on previous events or care may help one to make an immediate positive diagnosis which, although it may seem insignificant to the casual observer and of no importance to the owner, may be the link in the chain of events that enables the veterinarian to clinch the case immediately.

One of the most satisfactory investigations and diagnoses the writer ever made was of this nature. It will be stated briefly to illustrate the importance of an honest confession from the owner, which was the one thing necessary to make it possible to diagnose the case.

A rancher had lost about 25 good calves in about that many hours. It was learned that upon the afternoon of the preceding day these calves had been vaccinated both with blackleg bacterin and pulmonary edema mixed bacterin using different syringes and in separate areas of the body. This was "vaccination," under "history" as shown on the outline. At the time of vaccination the calves had been branded and the areas smeared with a pine tar preparation mixed with raw linseed oil in the proportion of about 50% of each. It was essential that the veterinarian be told these exact details. It was learned further that the animals had died about three hours after the coincident triple treatments. Since the owner had a force of men waiting to vaccinate more calves, he naturally wanted an immediate and unqualified diagnosis; all operations having been suspended until the cause of these deaths could be determined. He suspected the purity of the bacterins used, thinking one or both of them to be responsible for the loss. To the veterinarian the short period between vaccination and death of the calves was ample evidence upon which to rule against the toxic or contamination theory. It seemed that the only thing that could have killed the calves so quickly was a chemical rather than a bacterial poison.

The owner was curious to know what chemicals could cause such sudden death. A few such poisons were enumerated. At the mention of arsenic he suddenly remem-

bered that he had wondered somewhat about the contents of an old five-gallon can which had lost its label but he thought contained raw linseed oil. It had been mixed with the pine tar to be smeared on the brands. After a little thought he admitted it could easily have been an old can of arsenic dip which he kept about. This was the clew which quickly clinched the diagnosis but it was decided that a test should be made.

The owner agreed to chance the loss of three more calves. The same procedure as of the day before was carried out with these three calves except that the first calf was given the double vaccination alone, the second calf the double vaccination and branded, and the third calf the double vaccination, branded and smeared with the doubtful mixture. The two which had not been smeared showed no effect whatever but the third calf was dead in exactly three hours and 15 minutes. Of course a positive diagnosis of arsenic poisoning was given. It is seldom that we have such a good setup from which to make a diagnosis. Without this knowledge much time might have been spent and even then it might not have been determined what killed the calves and probably many more would have been sacrificed.

This case can be classified according to the outline as *a* under diagnostic inoculations. However this was not made in the usual way with a syringe but applied with a brush on the branded area, and it was proved that the bacterins administered had not contained a toxic substance. Other types of diagnostic inoculations as indicated in the outline are tuberculin, malein, etc.

History is important in a simple case like milk fever. In a typical case a cow ordinarily has had three or more calves and is usually from five to nine years of age and is reported as having calved about three days before becoming ill. The symptoms include paralysis and coma which come under the nervous system classification.

The fundamentals second only to correct diagnosis are the prevention of exposure by sanitation and other means, and by vaccination.

There are some infections against which we have as yet no effective vaccine; also, some destructive agents like poisonous plants which owners must control or take their losses. Sanitation is the key in the process of protecting animals from infectious diseases, as well as in the control of both external and internal parasites. Sanitary measures alone are not practical for controlling disease under some conditions, one of which is illustrated by blackleg—an organism so widely distributed in the soil and water in some sections that it is impractical to attempt sanitation alone as a control measure.

Another condition where dependence upon sanitation is not sufficient is seen in such filterable virus diseases as hog-cholera and encephalomyelitis. It is not known where these disease producing agents live in nature. Nor is it known where the carriers (such as mosquitoes that spread encephalomyelitis) acquire the disease in nature, although much is being learned about both the disease and the carriers and investigators hope soon to have a complete understanding of the disease and of the modes of acquisition.

Where animals are tested and reactors either slaughtered or segregated (both of which have been used in the control and eradication of infectious abortion and tuberculosis) the same basic principle obtains; that is, keep healthy animals from contact with infected animals.

We take pride in our achievements in the use of biological products which will immunize an animal without producing the disease. We have gone far since Edward Jenner, in 1796, observed that milk maids who contracted cow pox were thereafter resistant to small pox. This led to the development of small pox vaccine.

We now have fairly efficient vaccination against such filterable virus diseases as hog-cholera, encephalomyelitis in horses, canine distemper, sore mouth (ecthyma) in lambs, and rabies in various susceptible species, also against bacterial diseases such as anthrax and blackleg. Research must never end as the work is not finished; much remains to be done.

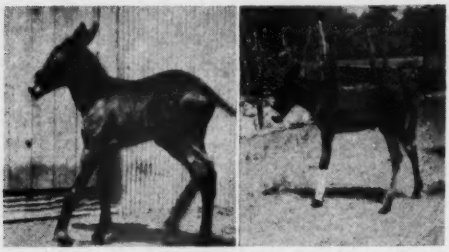
Contracted Tendons in Foals

By JOS. T. ALSTON and CLAYTON STEPHENS
Tupelo, Mississippi

The illustrations picture two types of cases of which we have several every spring and summer. They show both "before and after" photographs.

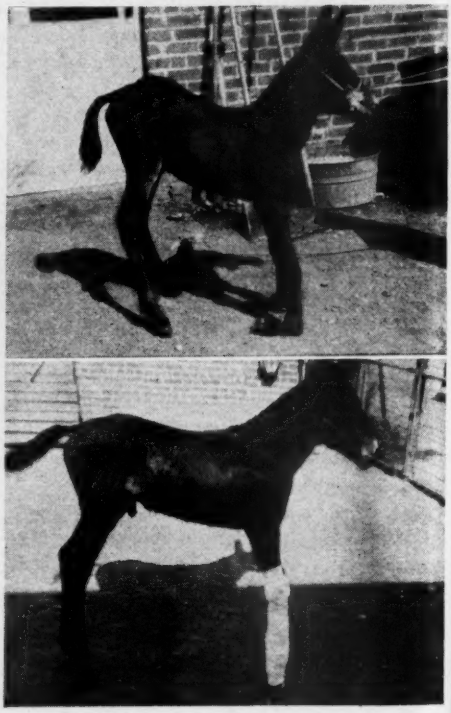
The colt at the age of three weeks had volar flexion of the left fore limb to the extent that knuckling at the fetlock occurred. By proper treatment it can be made normal but without such treatment the animal is worthless. In such cases this consists in dividing aseptically, one or both flexor tendons (depending upon the degree of flexion) about half way between the fetlock and the knee.

The colt is placed in a recumbent position. All legs, except the one to be operated



Tenotomy in a foal three weeks of age. Left, before being operated upon. Right, one week after the operation when the patient was discharged. The owner was instructed to leave the bandage on for another week. Recovery was complete

upon, are flexed and securely tied. The site of the operation is desensitized with novocaine, shaved and thoroughly cleaned and disinfected. The leg is then held by an assistant who grasps the foot in one hand and pulls forward and, at the same time, pushes back upon the knee with the other hand. This tenses the tendons. The cutaneous incision is made on the medial side of the leg when operating upon a front limb and on the lateral side when operating on a hind leg. It is seldom necessary to sever both tendons. An incision about one inch long is made directly down onto the tendons. A pointed hemostat is inserted through a small opening in the skin, pushed around the tendon and forced between it and the nerves and blood vessels, thus avoiding injury to these structures. The hemostat is then pushed upward and downward the length of the incision. The tendon is severed with a sharp, probe-pointed bistoury



This mule colt was completely over in both front fetlocks. Such cases must be operated upon early or necrosis at the bearing surface will render them incurable

which is inserted into the track of the hemostat, with the edge toward the tendon. One or two stitches in the skin to close the wound and bandages for a week complete the treatment.

If two legs are severely flexed and it is necessary to cut both tendons in each leg, just one leg should be operated upon at a time and when the first has healed the

same procedure should be carried out with the other flexed leg. However, it is seldom necessary to sever more than the flexor metatarsi perforatus and in such cases both legs may be operated at the same time. Occasionally a small tumifaction develops where the tendons unite. This is scarcely noticeable if only the deep tendon has been severed but is larger where both the superficial and deep tendons are operated upon.

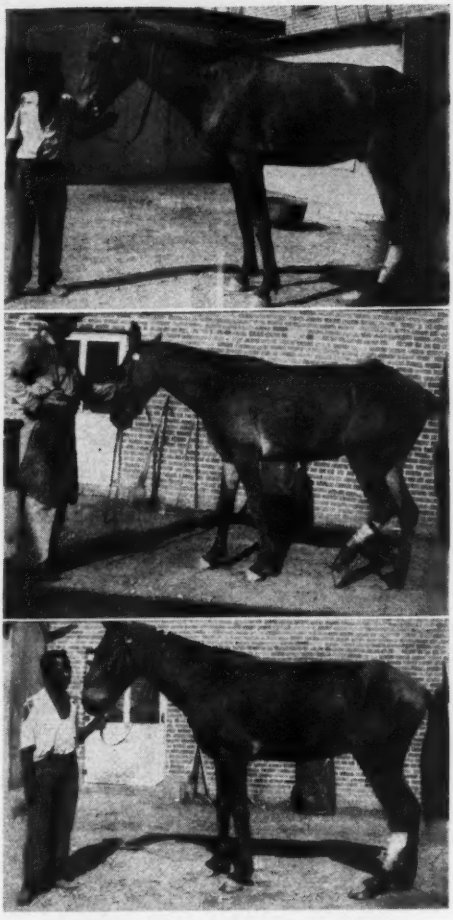
The second illustration represents an extreme case. Seldom are both legs so contracted. This colt walked on the front of the legs and was unable to extend either foot. After the operations, which consisted in dividing both tendons in both legs, the fetlocks and extensors were too weak for the colt to place its feet properly but if the feet were placed in the proper position it could maintain them there. This showed that dividing the tendons had corrected the anatomical defect. To support the legs until they gained strength a plaster of Paris cast was placed over the bandage as shown in the illustration. The colt then walked with ease. The cast and bandages were removed 10 days later. Recovery was entirely satisfactory.

Good results will not be secured unless strict asepsis be adhered to and cutting the nerves and blood vessels be avoided.

Accidentally Severed Tendons

While discussing the repair of tendons, mention may be made of those accidentally severed and the wounds infected.

The illustrations on this page show a mule accidentally cut by a plow. Both tendons were severed midway between the hock and fetlock. In such cases the wound is thoroughly cleaned and packed with sulfanilamide crystals. A shoe, with metal extension welded on, is nailed to the foot. This brace is made by taking an ordinary bar shoe and welding a strong bar about 18 inches long to the toe and another to the cross bar at the heel. Provision is made for a strap at the upper end of the extension to hold the foot flexed, as shown in Fig. 2. This strap can be loosened and taken off in treating the wound and to allow the foot, later on in the treatment, to be placed in a more nearly natural position. A model of this device was given us by D. F. Lucky, formerly State Veterinarian of Missouri, but now with the Fort Dodge Laboratories.



SEVERED FLEXOR TENDONS IN A MULE

Top: Before the brace was applied. Center: The brace in situ. Bottom: Three weeks after the injury occurred. No further treatment required. Contraction of the scar tissue will bring the foot back to a normal position in the course of six to eight weeks

An objectional feature of the appliance shown, is the narrow strap that goes around the leg. As it is apt to produce pressure necrosis a broader strap is desirable; or a suitable support may be had by applying bandages around the leg and the bar which extends up the leg. The wound may be treated open or closed.

Coprophagy in the Wild Rabbit, *Sylvilagus nuttallii grangeri* (Allen)

In conjunction with some investigations carried out in the vicinity of Logan, Utah, to determine the incidence and abundance in adventitious hosts of the common liver fluke, *Fasciola hepatica*, an interesting phenomenon concerning coprophagy in rabbits was observed. Since the literature on the subject has been collected and discussed by Taylor (1940)[1, 2] who considered the phenomenon to be pseudorumination, only those facts relating to the specific case mentioned will be discussed.

After having had some difficulty in collecting enough rabbits from particular locations for examination for parasites it was considered advisable to collect at random pellets from certain areas, and to determine whether any of the pellets contained eggs of *Fasciola hepatica*. These collections were undertaken following snowfalls. After several attempts it was observed that only an occasional pellet could be found, even though the snow showed an abundance of rabbit tracks due to the fact that these rabbits did not wander far from their communal burrows. The condition was observed, however, only in regions inhabited by the rabbit *Sylvilagus nuttallii grangeri* (Allen).

By examining the stomachs of the rabbits captured, a possible reason for the absence of pellets on the snow was revealed. Five of the rabbits have been examined since 1938, and in each case the stomach was fully distended with pellets; no other food was present, although vegetation likely to be eaten by rabbits was adequate in the region. The pellets in the stomach were intact, except for a very small number at the pyloric end. The crowded condition caused the pellets to become polyhedral in shape.

While coprophagy may be considered a physiological necessity, its origin is provocative. Because these rabbits frequent arid regions, where seasonal droughts periodically may practically destroy all food and sources of moisture it seems possible that the habit may have originated as a natural means of conserving both food and moisture.

WENDELL H. KRULL

Auburn, Alabama.

[1] Taylor, E. L., 1940. The demonstration of a peculiar kind of coprophagy normally practiced by the rabbit. *Vet. Rec.*, 52:259-262.

[2] Pseudo-rumination, 1940. *Vet. Med.*, 35:481.

★ ★ ★ BUY WAR SAVINGS STAMPS AND BONDS

Repair of Rupture of the Tendon of Achilles

In the November 1942 issue of VETERINARY MEDICINE there appeared a case report on ruptured tendon of Achilles in a greyhound, by George P. Hickman. I have treated a number of these cases in the dog and one in a cat and results were so gratifying that others may be interested in their report.

In all cases the rupture or injury occurred about one and one-half or two inches above the tuber calcis. The first case was an Irish terrier that had received a wound in this region, separating the tendon Achilles. This had occurred a month or six weeks previous to the time examined. It had been treated and apparently healed but the hock touched the ground when the animal attempted to walk. In this case there was about an inch of scar tissue in the tendon at the point of injury and for this reason the tendon was useless. This was no doubt due to too early use of the limb after injury and before healing was completed. Shortening of the ligament was advised. Under nembutal the ligament was isolated and severed as follows. An incision was made halfway through the thickened tendons then downward through the middle for a distance of about one and one-half inch, then out through the opposite side. About a half inch was clipped off each end of the severed ligament, the parts then pulled together and sutured with No. 0 Chromic catgut (intestinal type with needle attached). The skin was sutured with plain catgut, and a gum rubber perforated drainage tube inserted at the bottom of the wound to provide drainage. A modified Thomas extension splint was applied and left on for three weeks. In two days the drainage tube was removed

and dressings applied as needed. The splint was purposely left somewhat loose to permit slight use of the muscles. Healing of the skin occurred without event and in three weeks the splint was removed. Several weeks later the owner reported that it was impossible to determine by the action of the dog which leg had been injured.

The next case was similar except that the tendon had not healed and the severed ends were thickened and shortened. The gap of approximately a half inch was compensated for by slicing the stumps—beginning about three-quarters inch from the end the tendon was cut halfway through, then sliced down the middle to within a quarter-inch of the severed ends—then these flaps were reflected so that the freshened edges were in contact and sutured. Other treatment was conducted as in the former case. The tendon remained very thick and heavy, but normal function was restored. Another case similar to this one was treated successfully.

The cat presented an appearance more like the case described by Hickman. There was no evidence of external injury. Several knots were palpable along the course of the

tendons in this region, and the hock could not be extended voluntarily. However, the aponeuroses were not torn off the muscles. A doubtful prognosis was given and the ruptured tendons were brought into apposition as well as possible. Several weeks later the owner reported normal functioning of the limb.

The structure of the tendon of Achilles is as follows: the two heads of gastrocnemius terminate on a common tendon (the tendon of Achilles) and the soleus muscle is inserted into its anterior edge. The soleus is absent in the dog, but present and large in the cat. This tendon (the Achilles) first lies posterior to that of the superficial digital flexor but by a twist in both comes to lie in front of the latter. Anterior to these ligaments lies the tarsal tendon of the biceps femoris which inserts on the internal and anterior surface of the tuber calcis. I believe it is common practice to designate these tendons collectively as the tendon of Achilles. Their action, with the exception of the part of the superficial digital flexor that extends to the digit and acts as a flexor of the digit, is to extend the hock.

Our readers write in that they like to hear about the problems and cases of other practitioners.

In the dogs mentioned the superficial digital flexor and the tarsal tendon of the biceps femoris in addition to the tendon of Achilles were severed. Due to the extensive scar tissue present in these cases the identity of the various tendons was lost and, except in the cat, no attempt was made to preserve their identity. Since their action, with the exception of those fibers of the superficial digital flexor that extend to the digits, is to extend the hock joint, normal function was resumed after proper healing. Foot action seemed to be normal in these cases no doubt due to the fact that the action of the superficial digital flexor is chiefly mechanical.

F. A. ANDERSON.

Anti-Cruelty Society,
Chicago, Ill.

Autobiography of a Veterinary Practitioner

By E. T. BAKER, Moscow, Idaho

X

A Typical Country Practice

WHEN I saunter down Main street of "Our Town," which has been my home now for nearly 30 years, it takes me several hours to traverse four or five blocks. I meet an old friend who has been back east or over on the coast, and ask him about his trip. He warms up to the subject and a pleasant half hour slips by before we realize it. A farm wife meets me and asks me when I will be home, as she brought in a chicken liver that she is afraid is tuberculous. A dairyman sees me and asks when I can test his herd, and one of the bowling team hails me and inquires about our next match. A small boy stops me and says: "Say, Doc, what kin a feller do fer his pup whose hair is comin' out around its eyes?" We tell him to apply a little diluted iodine to the parts, being careful not to get any in the eyes. Next, a farmer meets me and as he has just come from the hospital where his wife has had a serious operation, he tells me about her, for I have known her many years.

On Tuesday and Friday mornings I go through our seven meat markets and inspect the contents, and stamp any new carcasses brought in since my last visit. Anything I would not put on my own table is condemned. I do this in a pleasant manner, and no one knows anything about it except the dealer and myself. When I get home, perhaps a farmer is waiting for some medicine, or to ask me to come out to his place. A young woman next brings in a puppy for a distemper "shot," and about this time the mail has arrived, with a number of queries from a farm journal. It has a subscription list of some 140,000, and about 1500 queries relating to sick animals are answered annually. In about 1450 of these I suggest calling in their local veterinarian.

Having been all over the northwest, I can visualize the writer's problem, and answer accordingly. Many stock owners live 50 or 60 miles from the nearest veterinarian, so we have to suggest some simple and harmless treatment.

About this time we knock off for dinner, which at our home, comes in the middle of the day, farmer style. Perhaps, after dinner we get a call or two out in the country, ranging from milk fever to vaccinating a number of pigs against cholera.

In summer, I would like to play golf, but it does not seem possible while I practice. I can picture myself on a farm, calling up the local veterinarian. I have a bloated cow, or my best horse is tangled in barbwire and the blood is spurting all over the place. Suppose the veterinarian's wife answers my frantic call with:

"I'm awfully sorry, but Doctor is out playing golf. I'll be able to get him in an hour or so."

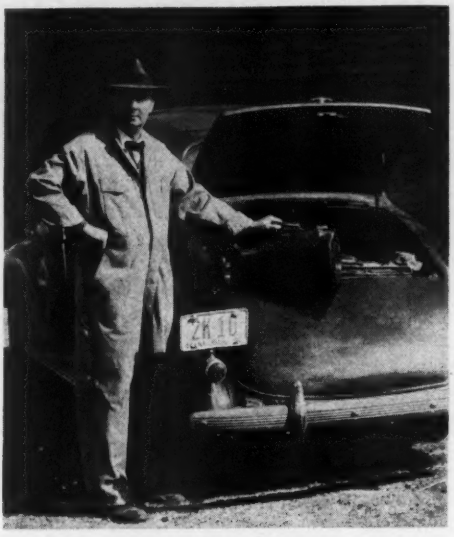
In the meantime my animal dies. Would I feel like calling him again? I hardly think so. When out on a call, I can usually be reached in a few minutes, and can hurry to an emergency without delay. But to be out playing golf! That would be considered an unpardonable sin in my section. Our local physicians have learned the same sad

lesson. Just about the time they get started on a foursome, some woman decides to increase the population, and a frantic young prospective father is having the heebie-jeebies. If his own doctor is not available, he gets another, and usually sticks to the latter from then on. It was the late Benjamin Franklin who said: "Take care of thy business, and thy business will take care of thee."

I have often wondered why the American Veterinary Medical Association always meets in summer. This is our busiest season, for harvest is on in full swing in our section. About the only time I can get away is from the middle of November to the last of February. This is also one reason why I never joined the Officers' Reserve Corps, much as I have wanted to. I would have to go to Fort Logan, near Salt Lake City, Utah, in August. As the distance is over 1500 miles, it would mean a three weeks' absence during our harvest. As I make our living in practice, it is up to me to take care of that work ahead of all else.

A small boy wants to know "What a feller kin do for his pup"

It is during the long winter evenings I find some time to devote to my favorite sport of bowling, and due to this exercise, I find that when the spring months come, I am in good physical condition. These things are mentioned from the standpoint of a typical country practitioner, and there are thousands of others in much the same boat. Each of us know our local conditions, and if we want to prosper, we must take advantage of these, and be available.



Here is the author—we persuaded him, as readers have suggested, "to get out of the horse's mouth or from behind the camera" and show himself

As I look back over my 27 years of practice so far, they may be classified as follows:

1913-14—Average	1930-33—Very poor
1914-18—War boom	1934-40—Average
1919-21—Poor	1941—
1922-29—Average	

It will thus be seen, 16 were average years; four were booming, and seven were poor. In other words, 15% were above the average; 60% average, and 25% below average. The young practitioner should keep this in mind, and in good years prepare for the inevitable bad ones.

During my travels over the northwest, I met practically every veterinarian in that territory and was struck by their eagerness to get rich quick; perhaps the more so because that didn't interest me at all. Many of them were making "big money," but lived in rented homes or apartments that

The author's bowling team—here he really enjoys life

were far from comfortable. They were engaged in practice, it is true, or had good salaried jobs, but their hearts were not in their work. They merely used their profession to make money to invest elsewhere. One man was investing all his money in a Montana or Alaska gold mine; another was paying all he could spare on a high-priced tract of land; others were in farming, sheep raising or were furnishing the money to run a service station or a mink farm. A few liked to sit at home and "peddle minerals" without getting their lily-white hands soiled in general practice. Always a couple would be in politics up to their necks, or trying to run their home towns, by being big business men. Perhaps, in the entire territory, there were not a half a dozen men living in their own homes, free from debt, and enjoying leisurely happy lives. Really important matters like the standing of the baseball teams in the national leagues and my own bowling score didn't interest them.

When I decided to practice, my whole ambition was to be as good a practitioner as limited cerebral capacity would permit. Instead of dabbling in oil or mining stocks, I bought the best instruments and supplies that were procurable for my business. I like a good, comfortable car, and have had a number of them. I had no desire to be rich, or to run the local lodge, or be a civic leader. I wanted my spare time to live an enjoyable life with my family, and to keep up with the latest developments in my profession. About once a year I attended some state association meeting, and came in contact with the leaders of the profession, and I always brought back home some good ideas for bettering my practice. I realized my limitations, and knew that I was just an average practitioner, and should have to attend strictly to business, if my income was to take care of my family, and create a little reserve for rainy days. I carried enough life insurance to protect my family in case I was wafted up to heaven to mingle with the rest of the saints. I had no desire to leave a large estate, for, as a general rule, that only helps the attorneys. Probably because of my early training or lack of it I had but two hobbies or diversions—photography and bowling. Neither are expensive in either time or money. I have already expressed my regret that I do not have more interest in play.

And so the years drifted along, the good and the bad. As our boat was small and kept close to the shore, panics, depressions and hard times had little effect on us. We lived within our income, always, and then had some to draw upon when collections were very anemic. I mention this only to stress the advantages of attending to the matter at hand, and not having too many irons in the fire. Many practitioners become so busy they have no time to make a living for themselves and their families, or to really enjoy life.

Abstracts

Viability of Eggs of the Thorn-headed Worm

Summary and Conclusions

Kates[2] carried out tests under laboratory conditions to determine the effects of high and low temperatures, drying, alternate wetting and drying, and ultraviolet irradiation on the viability of eggs of the swine thorn-headed worm (*Macracanthorhynchus hirudinaceus*). The criterion used to test the viability of the eggs was the ability of the contained larvae, or acanthors, to infect grubs of the green June beetle (*Cotinis nitida*). The work was carried on in 1938 and 1939 at the United States Department of Agriculture, Beltsville Research Center, Beltsville, Md.

Eggs in water were destroyed by instantaneous exposure to a temperature of 70° Centigrade (158° F.) and by 10 minutes' exposure to a temperature of 60° C. In one series of preliminary tests, not so well controlled, a small number of eggs survived higher temperatures.

The majority of eggs in water and in a dried condition survived continuous exposure to temperatures ranging from —10 to —16° Centigrade (14 to 3.2° F.) for as long as 140 days, when the test was terminated.

No appreciable reduction in number of viable eggs was observed in dry preparations exposed for 50 days at temperatures of 5 to 9° C. and 37 to 39° C., and for 265 days at temperatures of 21 to 26° C.

Alternate wetting and drying at temperatures of 37 to 39° C. destroyed the viability of eggs on soil in 368 days. On the other hand, eggs subjected to alternate wetting and drying at temperatures of 2 to 5° C. were still viable after 551 days.

Ultraviolet irradiation applied at a distance of 18 inches destroyed nearly all the dry eggs in a single layer in 10 minutes. Some eggs in films several eggs thick survived for 40 minutes. Some eggs in shallow water survived irradiation for as long as 120 minutes.

Data presented in this paper on the resistance, to experimental conditions, of eggs of thorn-headed worms furnish, in part, an explanation for the fact that eggs of this parasite have remained viable on soil for as long as 3½ years under conditions at Beltsville, Md., as reported in previous work.

[2] Kates, Kenneth C., 1942. Viability of eggs of the swine thorn-headed worm (*Macracanthorhynchus hirudinaceus*). *Jnl. Agr. Res.* 64:2, pp. 93-100.

Protective Coating for Chemical Warfare

An impermeable layer which prevents the penetration of mustard gas on the legs of horses[9] was made by painting on two or three layers of a glycerin-mucilage preparation made by mixing a mucilage in water, boiling and then adding glycerin. The material sets into a firm layer which is not easily scraped off, but can be removed by soaking in warm water. Painting the final layer of the mucilage-glycerin preparation with formalin hardens it and makes it still more durable.

The Effect of Fluorine in the Nutrition of Fattening Lambs

In experiments conducted to ascertain the effects of fluorine (rock phosphate) upon fattening lambs[1] it was found that there were no detrimental effects upon growth and feed consumption if the animal received up to 3mg of fluorine per day. A larger amount (6mg) caused a definite disturbance both in growth and feeding—the bones, although considerably larger, were weaker than those of sheep not receiving flourine. The breaking strength per gram of bone weight decreased significantly as the fluorine was increased. The percentage of ash increased slightly. The thyroid gland became larger and the fluorine and iodine content was greater as more fluorine was added to the ration. When block salt was fed animals the ratio of the iodine content to the iodine consumption was constant where fluorine also was used, but when block salt alone was fed the iodine content was less.

[9] Mocsy, J., 1941. Glycerin-mucilage as a protection against mustard gas. Abst. *Vet. Bul.* (Liverpool) from abst. in Dtsch. tierarztl, from Allatorv. Lapok 64.

[1] Hatfield, J. D., C. L. Shrewsbury and L. P. Doyle, 1942. The effect of fluorine in rock phosphate in the nutrition of fattening lambs. *Jnl. Animal Sci.*, 1:2, pp. 131-136.

Nutrition and Reproductive Failure

The livestock industry is familiar with the wide and economically significant variations in reproductive output of domestic animals that result from good or poor environmental conditions.[5] The cyclical abundance and scarcity of species in nature in response to favorable or unfavorable environment have long aroused scientific interest and speculation concerning the specific causes and mechanisms that are involved.

Temperature, food supply, predators and disease are doubtless the primary factors controlling animal populations in nature. The response of both wild and domestic animals to food supply is so marked that it is logical to inquire whether nature has provided animals with a protective mechanism, useful for survival of the species, for limiting or preventing reproduction under adverse conditions.

The relation of diet to reproduction has been reviewed by Phillips, Friedman and Turner and some of the pertinent information is summarized as follows:

Inanition in rats induced by reducing food intake 20 to 30% below that voluntarily eaten adversely affects reproduction. Food restriction that causes marked growth retardation in young or weight losses in adults results in cessation of estrus in the female, loss of sexual libido and motility of sperm, and testicular atrophy in the male. Anestrus often develops with a weight loss of only 15%. There is evidence of similar results in domestic livestock though clear-cut data are lacking in regard to how much weight must be lost or the degree of food restriction necessary to produce these effects.

Phosphorus, protein and vitamin B complex deficiencies likewise result in these manifestations. Vitamin A deficiency results in the death of the fetus or in the birth of nonviable young and in testicular degeneration. Iodine deficiency in animals causes reproductive failure primarily through development of a goitrous condition in the developing fetus. Manganese deficiency causes testicular atrophy, infantile mortality, and deformity. Essential fatty acid deficiency eventually causes cessation of estrus when the animals show clinical symptoms and poor general health. Vitamin E deficiency in the rat causes irreversible damage to testicular germinal epithelium and destroys the fetus through its effect on mesodermal tissues, the hematopoietic system and other rapidly differentiating tissues.

[5] Gilbert, H. R., 1942. Some endocrines in nutritional reproductive failure. *Jnl. Animal Sci.* 1:1, pp. 3-12.

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Seasonal Variation in Quality of Semen in Bulls

It has long been recognized that in many vertebrates spermatogenesis is not continuous but tends to occur at one rather definite period of the year.[6] Cyclic spermatogenic activity is characteristic of the majority of mammals with the exception of such domesticated and semi-domesticated species as the guinea pig, rabbit, rat, dog, boar, ram, stallion, bull and man. These species have long been classified as continuous breeders but evidence is now accumulating to show that although spermatozoa are produced throughout the entire year certain seasonal trends in the rate of spermatogeneses and the degree of fertility are evident.

The causes of sterility and the factors which influence fertility are numerous and at best only partially understood. Sterility is usually easily recognized, for it is manifest by complete reproductive failure whereas fertility is a relative condition and must be expressed in relative terms.

Although few critical studies of the influence of season upon reproduction in dairy cattle have been made, evidence has been accumulating that such influences do exist. Hammond, in his "Physiology of Reproduction of the Cow," states that although cows will breed throughout the year the reproductive forces are at a maximum during May and June and minimum during July and August, and Seath and Staples of the Louisiana station subsequently reported that more services per conception were required during the summer months than at any other period of the year.

[6] Erb, R. E., F. N. Andrews and J. H. Hilton, 1942. Seasonal variation in semen quality of the dairy bull. *Jnl. Dairy Sci.* 25:9, pp. 815-826.

A study of the reproductive efficiency of the Purdue Dairy Herd between 1920 and 1940 by Erb, Wilbur and Hilton of the Purdue station reveals an average breeding efficiency of 58.2% in August as contrasted with 74.3% in May. Although quantitative data were not available in the records of that 20-year period for determining the relative fertility of the males and females involved, it is likely that both sexes were affected. It is interesting to note that the quality of the semen produced by the bulls included in the present study was significantly superior during April, May and June and significantly inferior during July, August and September. Since the management and plane of nutrition of the bulls were similar throughout the experimental period it is concluded that the changes observed were the result of those factors which characterized the seasons—temperature, light, relative humidity and other general or obscure atmospheric factors.

The experiment was not designed to determine the specific influences of temperature, light or humidity but it is believed that environmental temperature was undoubtedly of considerable importance. Many workers have demonstrated the deleterious effects of elevated temperatures upon spermatogenesis in mammals. The direct application of heat to the testes, the insulation of the scrotum, the replacement of the testes in the abdominal cavity, or a continued febrile condition, cause partial or complete inhibition of spermatogenesis. The increased rate of respiration and uneasiness which is characteristic of cattle and other farm animals during periods of prolonged hot, humid weather is an indication that the regulation of body temperature is difficult and it would not be considered unusual if certain body processes such as semen production, were interfered with.

In the summary the authors state that as analyses of variance in various characteristics of semen production between bulls and between months, reveal highly significant differences for all factors studied except pH. The quality of the semen produced by the bulls was significantly superior during the spring and significantly inferior during the summer. The semen produced during the fall and winter months did not vary significantly from the mean. The average semen volume and initial motility was least in July, August and September and the average concentration of spermatozoa and total sperm per ejaculate was maximum during April, May and June. The average period of sperm survival was least in August, and lower in July, September and November than during the other months and the average number of abnormal spermatozoa was 25% greater during July, August and September than during the next highest month of the year.

Treatment of Chronic Mastitis with Various Bactericidal Agents

Seldom does *Streptococcus agalactiae*, the most common cause of mastitis, appear in an acute form.[8] Athough usually a cause of chronic mastitis *Str. dysgalactiae*, *Str. uberis* and others may be responsible for acute forms. The acridine derivatives, entozon, acriflavine, and also trypaflavin are administered by infusion. When an oil solution is injected via the teat canal directly into the milk cistern, advantages in large scale work are: smaller volumes of solution, less equipment required and simplification of instrument sterilization. Gramicidin or tyrothricin and novoxil also have been used.

It is emphasized that chemotherapy is a surgical procedure and should be conducted by a veterinarian lest great damage to the udder result from careless technique. A conservative figure for cures in an average herd by means of udder chemotherapy might be below 50% with some herds going as high as 80-90% cures. Mild cases offer the best chance of success. Chemotherapy should not be used on acute cases. Injection of tyrothricin and novoxil may safely be made during the dry period to save on material. Of the bactericidal agents effective against *agalactiae* the author found the alcoholic solution of gramicidin in sterile water and mineral oil with the dose properly adjusted, was the least irritating and most effective.

[8] Little, R. B., 1942. The treatment of chronic streptococcic mastitis with various bactericidal agents. *Intrnl. Milk Dealers Assn.* Bul. Abst in *Jnl. Dairy Sci.* 25:9.

Book Reviews

The Pharmacopeia of the United States of America (U.S.P. XII), prepared by the Committee of Revision and published by the Board of Trustees of the United States Pharmacopeial Convention, 1940. 880 pages. Mack Printing Company, Easton, Pa. 1942. Price—$7.50.

This twelfth decimal revision of the U.S.P., the first edition of which appeared in 1820, reflects the steady improvement in its content that has prevailed in former editions. The celerity with which the publication of U.S.P. XII followed the convention which arranged for it is not the least of its merits. U.S.P. XI was not distributed until 1936, this revision became official on Nov. 1st last. One hundred sixty new drugs and medicinal preparations are included in the present revision, reflecting advances in medical research and clinical observation in the 1931-40 decade.

The policy of the U.S.P. is to list a medicine for every therapeutic need if such is known and available. It includes what a long list of medical and pharmacological authorities believe to be the most important medical substances known. To attain the accolade of inclusion in the U.S.P., a product must first be referred to referees to pass upon its clinical value and the need for it. Each of these reports must in turn be passed upon by committees who decide as to its suitability for admission. Many advisory boards and committees, consisting of eminent authorities in special fields, assisted officials of Pure Food and Drug Administration, Army and Navy, representatives of the colleges of medicine and pharmacy, of medical associations, laboratories, etc., in compiling this work.

Among the new preparations, biological products, the sulfa drugs, barbiturates, narcotics, anaigesics and anesthetics and vitamins, possess the greatest interest for veterinarians. For these, as for all other medicinal preparations, the basic product is given and under it the most suitable compounds or preparations of it, together with a standard of quality, methods of preparation and of assay.

A Spanish edition of U.S.P. XII is official in Costa Rica, Cuba, Dominican Republic, Nicaragua, Panama and Puerto Rico, and widely used in all other Spanish-American countries.

To keep this edition abreast of the progress in medicine numbered supplements will be issued at frequent intervals and in 1945, at the approximate half-way point between this and the next decennial revision, a bound one will be issued. All supplements, including the bound one, will be supplied free to purchasers of the present edition.

You may obtain any book reviewed in this department by remitting the published price to the Book Department of VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago, Ill.

Introduction to Parasitology. *By A. S. Pearse,* Professor of Zoology, Duke University. 367 pages; 448 illustrations. Charles C. Thomas, Springfield, Ill. 1942. Price—$3.75.

This is, almost exclusively, a story of parasites. Little is said of the host but much of the parasite, particularly of its life history, which is presented in an interesting, readable, comprehensive manner. Treatment and prevention are almost but not quite omitted; symptoms of infestation scarcely mentioned. This will disappoint veterinarians, who are naturally more interested in parasitisms than in parasites.

The illustrations are a remarkably valuable feature of the work, and go far to center the reader's interest, like the author's in the parasites themselves, quite aside from their economic implications.

The author states the work is intended to supplement laboratory work and lectures, and not one from which routine lessons are to be assigned. Veterinarians interested in the parasite's niche in the animal world; its adaptation to its environment, and the often strange methods developed for survival will find this little book highly entertaining, authoritative and informative.